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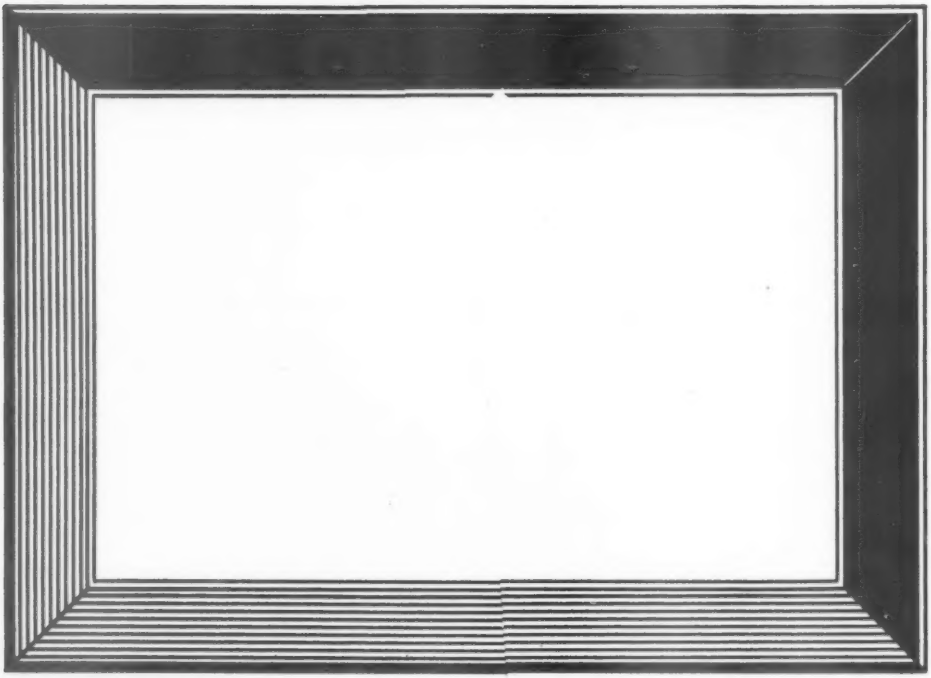

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L. A. Deaville

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"Jacques"

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AUGUST-SIMPSON Mix-Mullers

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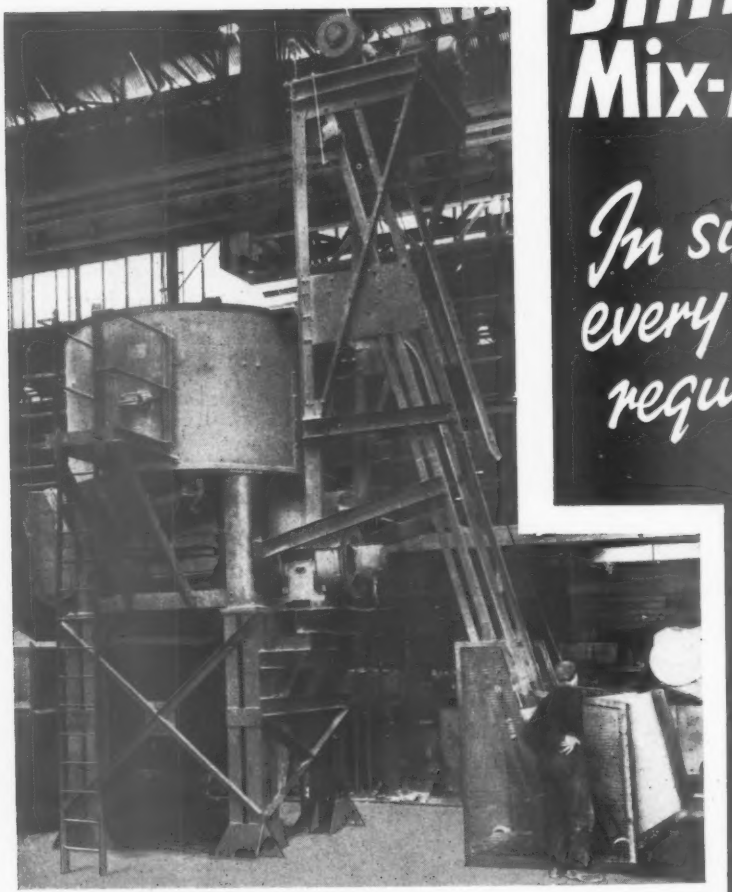
Photograph shows a No. 3F size August-Simpson Mix-Muller, Bucket Loader and Independently driven Aerator. Large batch capacity—approximately 4,000 lbs.



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FOUNDRY TRADE JOURNAL
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Restrained Optimism

Reading the experts' views of the prospects for 1958 leaves one with the overall impression that the trade barometer is running between "set-fair" and "changeable." The recent order obtained for a new Canadian liner is important for it has repercussions on a multitude of business concerns apart from the actual shipbuilders. As is invariably the case, all sections of the foundry will benefit. The announcement by a large motor-car company that their exports are at record levels is indeed a good augury for the early months of the year. The iron and steel industry reports that a change has come about and it is now in a position to meet commitments without much delay. Put another way, the position has changed from a sellers' to a buyers' market. It may be that in this field the maximum charges permitted will no longer be regarded as the minimum. When steel is sold for any purpose whatsoever, be it for ship construction, new buildings or sheets for automobiles, orders for castings are a natural concommitant. In spite of the changed conditions, the leaders of thought in this industry are neither pessimistic nor unduly optimistic. The better showing of sterling *vis-à-vis* the dollar should result in the receipt of more raw materials for pounds spent overseas. However, unless these lower costs be reflected in overseas quotations, the higher cost of sterling will reduce the power of competition. This, of course, will apply also to Canada, where the prospects for increased business seem very promising. The recent Canadian criticism of British sales methods, to our mind, only applied to consumer goods of the type where the man in the street is the consumer. For these, the American and Canadian markets are homogeneous. For the sale of capital goods, we agree there is obviously need for "on the spot" representation, and it is pleasing to note that intensive efforts are being made to popularize British foundry plant and supplies in Canada.

Amongst adverse factors operating in the immediate future are the suspension of orders due to currency restrictions operating in various overseas markets and the institution (as, for example, in New Zealand) of quotas or complete embargoes for imports. Then, of course, the 7 per cent. Bank rate operates adversely against those firms wishing to extend their shops or buy new plant and who do not possess the immediate cash resources for so doing. Another major adverse factor is an application to be filed by the miners' trade union for increased wages. If such an increase comes about, then it is to be hoped that this time it will be carried by taxpayers in the form of a Government subsidy. Our local Member of Parliament informed us, that such an action would cause employees in other industries to seek similar accommodation. To our mind, as the stabilization of the price of coal would go very far towards stopping increases in the cost of living, no other similar conditions should arise. Surely by now it should be realized that an increase in the price of coal is not an addition but a multiplication when its final affect on the cost of living is assessed.

Foundrymen's energies in 1958 must be directed to increased productivity, associated with better-directed sales policies. New machinery and the more intelligent siting of existing plant will go far towards reducing manufacturing costs, whilst the better use of labour, now often badly wasted, is an essential. Time- and motion-study must not be confined only to the great mass-producing firms; its principles must be assimilated by the managements of quite modest concerns. It should be realized that if but a decade ago someone had stated that there were markets in North America for British cars, mincing machines and typewriter frames, their assertions would have been treated with derision. Pioneering work is needed and answers to such questions as "why cannot we sell abroad?" ascertained. Whilst we grumble at the Government as a prerogative, we wonder if businessmen ever realize that the services given by the British Board of Trade, through their consulates and other information sources, are really the envy of most knowledgeable foreign businessmen. We strongly counsel that increased use should be made of these services.

RSA Offer of Endowed Prizes, 1958

The Royal Society of Arts, as trustee for the undermentioned endowments, offers the following prizes during the year 1958: *Howard Prize of* £50 *for Mechanical Motive Power*: The Howard Trust was established in 1868 for the purpose of making awards periodically to the authors of treatises on steam or other motive agents, and a prize of £50 will be awarded to the author of a treatise on some aspect of the subject of motive agents. *Fothergill Prize of* £20 *for Fire Prevention or Fire-fighting*: Under the Fothergill Trust (established by the will of Dr. Fothergill in 1821) a prize of £20 is offered for a descriptive essay or model embodying some new idea for the prevention or suppression of fire. General conditions of entry may be obtained from the secretary of the Royal Society of Arts, 6/8 John Adam Street, Adelphi, London, W.C.2.

Correspondence

"WEAKNESS REVEALED"

To the Editor of the FOUNDRY TRADE JOURNAL.

SIR,—I read with interest your editorial "Weakness Revealed" published in the JOURNAL of December 19, and I agree wholeheartedly with your opinion of the lack of direction and continuity in the education of foundry personnel. It was suggested that there should be some central authority to direct education for the foundry industry. This is obviously not easy to attain, but I believe a first step would be to band the *teachers and lecturers* of foundry techniques in the technical schools and colleges.

In most of the crafts and sciences taught in the technical colleges the specialists teaching these subjects are associated on a national level. Special courses are organized at vacation times with set programmes of lectures and, perhaps more important, the participating teachers may meet and discuss their difficulties and techniques. These courses are supported by the HM Inspectors and the local education authorities (who usually afford financial assistance) and it is possible for external examiners to be in attendance.

There must now be sufficient teachers of foundry subjects (foundry technique, patternmaking and metallurgical) to form an association such as I have indicated. I would suggest that the Institute of British Foundrymen could help in the organization of such an association; indeed it could exist within the framework of the Institute. Such an organization could arrange lectures at regional centres, *e.g.*, the National Foundry College. It could put the foundry industry's claim for education on the map with the Ministry and local authorities, and would give greater co-ordination in teaching methods and enable participating teachers to keep up to date with advances in the latest techniques.

There must be many foundry specialists who are employed as teachers in the Institutes of Further Education who, like me, feel that a banding together could sincerely help in the development of a more efficient education service for the benefit of the foundry industry.—Yours, etc.,

PETER BROWNE,
Lecturer in Patternmaking and Foundry Practice,
Derby & District College of Technology.

Forty Years Ago

The Editor, in the January 1918 issue of the JOURNAL, continued his propaganda for the institution of a foundry technical bureau, by which he meant the information departments such as are now, and so usefully, operated by the research organizations. Under the heading "New Companies" there appeared the names of Heathcotes (Cleator Moor), Limited, and Robert Jenkins & Company, Limited. There was also a note that the Stanton Ironworks Company, Limited, had opened a London office at Maxwell House, Arundel Street, to sell iron castings, a section of their business previously undertaken by an agent.

WORKING IN CLOSE technical co-operation, Ruston & Hornsby, Limited, Lincoln, and J. L. Kier & Company, Limited, civil engineering contractors, of London, S.W.1, are to design, develop, and build nuclear power stations with electrical generating capacities of from 5 to 25 mw. A combined design team is being established for this purpose at Lincoln.

Acknowledged, with Thanks

The receipt of diaries, calendars, Christmas cards and gifts, at the JOURNAL offices is gratefully acknowledged from the following:—

Allied Ironfounders, Limited; Air Control Installations, Limited; Aero Research, Limited; Aluminium Development Association; B.I.P. Chemicals, Limited; David Brown & Sons, Limited; British Oxygen Gases, Limited; British Nylon Spinners, Limited; S.A.Ph. Bonvillain & E. Ronceray; British Piston Ring Company, Limited; Baker Platinum Division, Engelhard Industries, Limited; British Bath Company, Limited; British Cast Iron Research Association; British Steel Castings Research Association; British Resin Products, Limited; Barnard & Sons, Limited; R. J. Bown; Bradley & Foster, Limited; Butterley Company, Limited; William Cook & Sons (Sheffield), Limited; Catton & Company, Limited; Chamberlin & Hill, Limited; George Cohen Sons & Company, Limited; Colt Ventilation, Limited; Cupodel, Limited; Council of Ironfoundry Associations; Constructional Engineering Company, Limited; Dowty Group, Limited; Dixon & Partners, Limited; V. Delport; E. Daybell; Dustuctor Company, Limited; Eyre Smelting Company, Limited; English Steel Corporation, Limited; Dr. and Mrs. O. P. Einerl; Frodair Iron & Steel Company, Limited; F. & M. Supplies, Limited; Foundry Suppliers, Limited; Fraser & Chalmers Engineering Works; Federation of Engineering Design Consultants; George Fischer, Limited; Foundry Services, Limited; Mario Fortino; Fulmer Research Institute; Gas Council; T. Gray; J. D. Gardom; S. Gordon; H. Hendra & Son; Holman Bros., Limited; J. Hobkirk Sons & Company, Limited; W. J. Hooker, Limited; J. A. Hufton; Head Wrightson Machine Company, Limited; L. A. S. Harbourne; E. F. Hodges; International Alloys, Limited; Institute of British Foundrymen; Ironfounders' National Confederation; J. F. B. Jackson; A. Karszon; B. Langum; E. Lipscomb; A. B. Lloyd; Lake & Elliot, Limited; B. Levy; Marco Conveyor & Engineering Company, Limited; Monsanto Chemicals, Limited; Morris Motors, Limited; Mond Nickel Company, Limited; Adolph Morath; H. J. Meerkamp van Emden; McConnells (London), Limited; Millspaugh, Limited; R. Maule; Northern Aluminium Company, Limited; Walter Nurnberg; Phosphor Bronze Company, Limited; F. Perkins, Limited; Pyrene Company, Limited; Premo Pattern Company, Limited; George C. Pierce; Print for Industry, Limited; Ruston & Hornsby, Limited; Ransomes, Sims & Jefferies, Limited; J. Rastall & Son, Limited; S. Russell & Sons, Limited; Ridsdale & Company, Limited; H. Rogers; Stewarts and Lloyds, Limited; Stein & Atkinson, Limited; Colin Stewart, Limited; Stephens Advertising Service, Limited; Sidney-Barton; J. Stone & Company (Charlton), Limited; Tube Investments, Limited; Trucast, Limited; A. Talbot; B. Tripp; S. Turner; Tangyes, Limited; S. Thegel; Henry Wiggin & Company, Limited; Wellworthy, Limited; A. R. Wizard; Mr. and Mrs. T. H. Weaver; B. Waters; A. Wigley (Belper), Limited; Wesman Engineering Company, Private, Limited; Zinc Development Association.

THE 1958 CONVENTION of the Scientific Instrument Manufacturers' Association will be held at Harrogate from November 6 to 9. Mr. P. J. Ellis (R. B. Pullin & Company, Limited), honorary treasurer of SIMA, has been nominated chairman of the Convention Committee. The six previous conventions have been held at Eastbourne.

New Year Honours

Awards to Leaders of the Foundry and Iron & Steel Industries

Recognition is made in the New Year Honours List of the services of many associated with the foundry, iron and steel, and allied industries. They include Dr. Ashley S. Ward, president of Thos. W. Ward, Limited (knight bachelor), Mr. Halford Reddish, the Rugby industrialist (knight bachelor), Sir Harold Yarrow, chairman and managing director of Yarrow & Company, Limited, the Glasgow shipbuilders (G.B.E.), and Mr. E. H. Ball, managing director of the British Thomson-Houston Company, Limited (C.B.E.).

BARONET

Col. Sir ROBERT CHAPMAN, for political and public services in the north of England. He was, until 1956, deputy chairman of Geo. Angus & Company, Limited, power transmission, fire, gear, and fluid sealing engineers, of Newcastle-upon-Tyne, and is still a director.

KNIGHTS BACHELOR

Mr. ARTHUR THOMAS BARNARD is Director-General of Inspection, Ministry of Supply. He was formerly chief superintendent and then deputy Director-General of Royal Ordnance Factories and took up his present post in 1956. Mr. WALTER BARRIE, chairman of Lloyd's, is a director of John Ferguson & Sons (Glasgow), Limited, foundry brushmakers. Mr. WILLIAM RICHARD JOSEPH COOK, deputy director of the Atomic Weapons Research Establishment at Aldermaston, held a number of scientific posts in research establishments of the War Office and the Ministry of Supply between 1928 and 1947 when he was appointed director of physical research to the Admiralty. Mr. STANLEY JAFFA HARLEY, for political and public services in the Midlands. He is chairman and managing director of the Coventry Gauge & Tool Company, Limited, and a director of its overseas subsidiaries. His term as president of the Coventry and District Engineering Employers' Association ended last year and he is deputy president of the Gauge and Tool Makers' Association. He is a member of the councils of the Institution of Production Engineers and the Machine Tool Trades Association and a vice-president of the National Federation of Engineers' Tools Manufacturers. Prof. CHRISTOPHER KELK INGOLD, FRS., Professor of Chemistry at the University of London since 1930 and director of chemistry laboratories since 1937. He was president of the Chemical Society from 1952 to 1954. Mr. HALFORD WALTER LUPTON REDDISH, for political and public services in Rugby. He is chairman and managing director of the Rugby Portland Cement Company, Limited, and subsidiary companies, chairman of Cockburn Cement Pty., Limited, the Scottish Construction Company, Limited, Trinidad Cement, Limited, and the Trussed Concrete Steel Company, Limited. Early last year he led a Dollar Exports Council team to Canada to make an " on-the-spot check " of Britain's export prospects. Mr. FOSTER GOTCH ROBINSON (for public services in Bristol) is chairman of Teleflex Products, Limited, makers of remote controls and mechanical handling equipment, of Chadwell Heath (Essex). Dr. ASHLEY SKELTON WARD, for political and public services in Sheffield. One of Sheffield's best-known industrialists, Dr. Ward is president of Thos. W. Ward, Limited, and chairman of the Park Gate Iron & Steel Company, Limited. Only last year on medical advice, he relinquished his position as chairman and joint managing director of Marshall Sons & Company, Limited, Gainsborough (Lincs) and its subsidiary companies. He is vice-chairman of Laycock Engineering, Limited (one of the Birfield group), and Clayton & Shuttleworth, Limited. Dr. WALTER JOHN WORBOYS is chairman of the Council of Industrial Design and has been a director of Imperial Chemical Industries, Limited, since 1948. He is vice-president and former chairman of the Association of British Chemical Manufacturers and is a member of the Council of the Society of Chemical Industry.

ORDER OF THE BATH
CIVIL DIVISION
KCB

Prof. HARRY WORK MELVILLE, FRS., secretary of the Department of Scientific and Industrial Research and one of Britain's leading physical chemists. He was appointed secretary of the DSIR in 1956, having served on the Council since 1946. He has been Mason Professor of Chemistry at Birmingham University since 1948. He became a director of Radiation, Limited, in 1954.

CB

Mr. HAYNE CONSTANT, FRS, started work on the RAE gas turbine project in 1936, was appointed deputy director of the National Gas Turbine Establishment in 1946, and director in 1948. Mr. JOHN EDWARD SERBY, Director-General, Guided Weapons, Ministry of Supply, since 1954, was formerly Junior Scientific Officer to the Admiralty. He was deputy director, RAE, Farnborough, from 1950 to 1954.

ORDER OF THE BRITISH EMPIRE
Civil Division
GBE

Sir HAROLD EDGAR YARROW, chairman of Yarrow & Company, Limited, shipbuilders, engineers, and boilermakers, of Glasgow, chairman of the Clydesdale & North of Scotland Bank, Limited, and a director of the Midland Bank, Limited. He was elected president of the Institution of Engineers and Shipbuilders in Scotland in 1956. He is closely associated with the work of Glasgow University and in 1953 founded the Yarrow Fund, which has been devoted to the University's department of naval architecture.

KBE

Mr. NEVILLE ARCHIBALD GASS, chairman of the British Petroleum Company, Limited. Brig. GEORGE HANDS WALTON, is a director of a number of companies including the Morgan Crucible Company, Limited, and North Eastern Trading Estates, Limited. During the war he was seconded to serve on the Middle East Board of the United Kingdom Commercial Corporation, Limited.

CBE

Mr. ERIC HAROLD BALL, managing director of the British Thomson-Houston Company, Limited, Rugby, and chairman of the British Thomson-Houston Export Company, Limited, and overseas subsidiaries. He is also chairman of Birlec, Limited, and the AEI Lamp

New Year Honours

& Lighting Company, Limited, and a director of the A.E.I.-John Thompson Nuclear Energy Company, Limited, Associated Electric Industries, Limited, and Power Securities Corporation, Limited. He has held office as chairman of the British Electrical and Allied Manufacturers' Association. Dr. CECIL REGINALD BURCH, F.R.S., Warren Research Fellow in Physics at Bristol University, was for 10 years a member of the physicist research department of the Metropolitan-Vickers Electrical Company, Limited, Trafford Park, Manchester. Prof. RHYDWYN HARDING EVANS, Professor of Civil Engineering and administrative head of engineering departments at Leeds University. Lord GEDDES, chairman of the Admiralty Fuels and Lubricants Advisory Committee and a former member of the Shell group of oil companies. Mr. CHRISTOPHER HOLLIS JOHNSON, Director of Materials and Explosives Research and Development, Ministry of Supply. Mr. JAMES ALFRED MASON, manager and director of the Automatic Telephone & Electric Company, Limited, Liverpool. Mr. WILLIAM COLIN CAMPBELL ROSE, assistant secretary, Ministry of Power; Mr. KENNETH PATRICK RUSH, chairman of Pauling & Company, Limited, civil engineering contractors, of London, S.W.1, and of Rush & Tomkins, Limited; Mr. WILLIAM ARTHUR SUMMERS, managing director of Hunting Percival Aircraft, Limited; Mr. RALPH WINTON WEST, principal of the Battersea College of Technology.

OBE

Mr. LESLIE RICHARD EYRE APPLETON, chief engineer (weapons division), Fairey Aviation Company, Limited. Mr. DAVID GARDNER BROWN, chairman of the Tyneside District Advisory Committee of the Northern Regional Board for Industry, managing director of the Redheugh Iron & Steel Company (1936), Limited, and chairman of the North Regional Council of the Federation of British Industries. Mr. GEORGE FREDERICK BROWN, director of the Cottage Laboratories, Limited, engineers, of Cobham (Surrey), an associate of the Plessey Company, Limited. Mr. NORMAN CARTER, chief naval architect and technical manager, Swan, Hunter, & Wigham Richardson, Limited, Wallsend-on-Tyne. Mr. WALLACE JOHN CHALLENS, senior superintendent of weapons electronics at Aldermaston Atomic Weapons Research Establishment. Mr. JAMES FORD GILLIES, vice-principal of the Belfast College of Technology. Mr. ROY ALBERT FREDERICK HAMMOND, principal scientific officer of the Armament Research and Development Establishment, Ministry of Supply. Mr. ERNEST WILLIAM HANCOCK, immediate past-president of the Institution of Production Engineers, director and general manager of Humber, Limited. He is a member of the Council of the Production Engineering Association and chairman of the Coventry Local Productivity Association. Mr. REGINALD ARTANE MCMAHON, secretary of the British Electrical and Allied Industries Research Association. Mr. JOSEPH O'HAGAN, general secretary of the National Union of Blastfurnacemen, Ore Miners, Coke Workers, and Kindred Trades. Mr. ERNEST GEORGE ROW, chief valve engineer, Standard Telephones & Cables, Limited. Mr. STANLEY HATHAWAY SMITH, finance and accounts officer of the Department of Scientific and Industrial Research. Mr. WILLIAM SWIFT, director and deputy general manager of Joseph Lucas Gas Turbine Equipment, Limited, Birmingham. Mr. ARTHUR SYKES, technical director of David Brown & Sons (Huddersfield), Limited, and a director of David Brown-Jackson, Limited, and David Brown Precision Equipment (Pty.), Limited, South Africa.

MBE

Mr. HARRY ANNIS, chief inspector, Metropolitan-Vickers Electrical Company, Limited. Mr. J. A. BARBER, contracts manager, J. & H. McLaren, Limited, agricultural engineers and diesel engine builders, of Leeds. Mr. W. L. BOWER, chief designer, Jas. Neill & Company (Sheffield), Limited, steel and tool makers, etc. Mr. E. F. BURFORD, manager, heavy construction department, G. A. Harvey & Company (London), Limited. Mr. F. M. EVANS, chief diesel designer, C.A.V., Limited, London, W.3. Mr. S. F. HATHAWAY, senior experimental officer, National Physical Laboratory. Mr. R. K. HENDERSON, chairman, Edinburgh District Advisory Committee of the Scottish Board for Industry. Mr. GEOFFREY HOLLINGSWORTH, assistant manager, steel production, Arthur Balfour & Company, Limited, Sheffield. Mr. A. L. HUTCHISON, executive officer, Ministry of Power. Mr. J. K. LIGHTFOOT, works superintendent, English Electric Company, Limited, Stafford. Mr. J. W. MATE, Sheffield district secretary of the Confederation of Shipbuilding and Engineering Unions and a member of the Scrap Iron and Steel Board and the Refractories Industry Silica Brick Wages Board, and vice-president of Sheffield Productivity Committee. Mr. E. L. NEWPORT, manager, development fitting shop, Bristol Aero-Engines, Limited. Mr. G. MCG. PERRY, assistant manager, electrical department, Harland & Wolff, Limited, Belfast. Mr. JAMES RUTHERFORD, foundry manager, William Beardmore & Company, Limited, Glasgow. Mr. LEONARD SHARP, chairman, Huddersfield and Halifax District Committee of the East and West Ridings Regional Board for Industry. Mr. T. W. SHIELDS, superintendent, fitting and assembly shops, Baker Perkins, Limited, Peterborough. Miss I. M. SLADE, information officer, British Iron and Steel Research Association. Mr. F. W. SMITH, superintendent, boilershop, John I. Thornycroft & Company, Limited, founders, shipbuilders, etc. Mr. W. R. SUTHERLAND, chief draughtsman, Parsons Marine Engineering Turbine Research and Development Association. Mr. BENJAMIN TREWHITT, shipyard manager, Wm. Doxford & Sons, Limited, Sunderland. Mr. D. V. YOUNG, civil defence controller, Birmingham Small Arms Company, Limited.

BRITISH EMPIRE MEDAL

Mr. T. BARTHORPE, turner, William Jessop & Sons, Limited, Sheffield; Mr. C. L. BEECH, foreman, British Chrome & Chemicals, Limited, Stockton-on-Tees; Mr. W. H. BLANEY, packer, National Physical Laboratory; Mr. W. H. CARABINE, stores stocktaker, Tees Side Bridge & Engineering Works, Limited, Middlesbrough; Mr. C. G. JONES, chargehand, W. H. Allen, Sons & Company, Limited, Bedford; Mr. H. JONES, foreman electrician, Harland & Wolff, Limited, Liverpool; Mr. B. N. MOORE, Wm. Doxford & Sons, Limited; Mr. T. L. THOMPSON, foreman fitter, Vickers-Armstrongs (Engineers), Limited, Newcastle-upon-Tyne; Mr. B. T. WALKER, toolmaker, Thomas Bolton & Sons, Limited, Stoke-on-Trent; Mr. W. WORTLEY, Short Bros. & Harland, Limited, Belfast.

Value of Heat & Power Surveys

Eight heat and power surveys, carried out in the north-western area by the National Industrial Fuel Efficiency Service, cost £1,700 to the firms concerned and revealed scope for annual savings valued at more than £40,000. In his monthly report to the board of NIFES, the chief executive, Dr. W. Angus Macfarlane, states that during November new contracts were made with 154 firms with an annual consumption of 75,780 tons of coal or its equivalent. The value of heat and power survey and regular service agreement bookings for the month exceeded £12,300, compared with £9,200 for the corresponding period of 1956.

Application of Quality Control to a Moulding-sand System

By L. A. Deaville

Control of the moulding sand in the particular system dealt with had previously been carried out on a purely empirical basis, with the result that the sand, though usable, was extremely variable in its properties. The aims of the present investigation in control were the following:—(i) To achieve a sand of known and consistent quality; (ii) to be able to vary the qualities of the sand at will; (iii) to obtain control of fundamental variables, and (iv) to achieve general improvement in casting quality. The Author felt that the best way of achieving these aims would be to apply modified statistical quality-control methods, of which he had a limited knowledge. The period dealt with in this paper is divided into two twelve-monthly sections.

Mr. Deaville has been attached to the Glacier Metal Company's non-ferrous foundry for 2½ years as assistant to the foundry metallurgist. After matriculating in 1941, he joined the firm as an apprentice chemist, rejoining as research assistant after National Service. While studying metallurgy during evenings, he has been employed at Glacier in development and control work.

Description of Plant

The cycle for the sand in the foundry is as follows. A 40-ton capacity storage hopper supplies sand to a 1,000-lb.-capacity roller muller from whence the milled sand is supplied by two conveyors to the feed hoppers situated above the moulding stations. Used sand is returned to the storage hopper from the knockout area by two more conveyors, one of which also carries new-sand additions fed on to it by a rotating hopper of 400-lb. capacity (see Fig. 1).

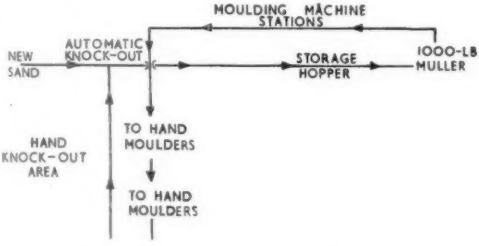


FIG. 1.—*Diagram of the system-sand cycle.*

Operation of the System

Before the introduction of revised procedures, the system was operated in the following manner: A pre-set weight of sand was drawn from the storage hopper and loaded by an electric hoist into the muller, where water additions were made, using a flowmeter to measure the addition. Dry clay-bond additions were also made and the sand was milled for three minutes. A small amount of sand was released and checked by the operator, if this was of satisfactory quality the full bulk of the sand was released to the moulding stations. New sand was added to the system when the storage hopper began to empty, or when the foundry supervisory staff felt that the qualities of the system sand had deteriorated badly. The method of making new-sand additions was to shovel raw sand and clay bond into the rotating feed hopper.

Compostion of the System Sand

The system uses sand of the semi-synthetic type, consisting of: (*a*) Naturally-bonded sand such as Mansfield red or Erith loam; (*b*) a low-clay, or clay-free sand such as Erith silica, Ham Hill silica, Chelford silica or Ryarsh silica: (*c*) Additions of a clay bond such as bentonite or Berk Bond.

Faults in Original Procedure

Observation and discussion among the staff revealed a number of causes for the lack of control of the system sand, which are listed in what follows:

(1) Various sands had been tried in the system, but usually for short periods only, hence the grain-distribution of the sand had a wide range.

(2) The method of making new-sand additions permitted the existence of "patches" of sand with widely varying qualities.

(3) Operational control of the sand at the mill was mainly by the "feel" of the sand rather than by measured criteria.

(4) All additions except water were made by guesswork instead of by measures of known capacity.

(5) No checks were kept on the grading or clay content of either the system sand or the raw sands received from the sand suppliers.

(6) Raw-sand additions were made at irregular intervals in a haphazard manner.

(7) There was a strong possibility that coresand was leaking into the moulding-sand system at the knockout areas.

Application of Quality Control to Sand

First Control Instituted

The following procedure was adopted and carried out for a period of approximately twelve months.

(1) New-sand additions were based on the use of one third Mansfield red, two thirds Ryarsh silica, with Berk Bond additions at the rate of 6 per cent. of the Ryarsh silica sand added. These sands were chosen for reliability of delivery and consistency of grading, though, of course, no claim is made that sand from other sources cannot be equally consistent.

(2) New-sand additions were to be made by placing alternate layers of Mansfield red, Ryarsh silica and Berk Bond in the rotating hopper until it was full, switching on the motor and allowing the hopper to empty before refilling it with more sand.

(3) Routine tests of sand quality to A.F.A. standards methods were to be taken four times daily and the results to be plotted on a control chart.

(4) All additions to be measured, using measures of known capacity, and records kept of all additions made.

(5) Checks of grading and clay content, to A.F.A. standards, to be carried out once weekly on the system sand, and on every batch of raw sand delivered.

(6) Additions of new sand to be made regularly, under supervision.

(7) Instructions to lessen the possibility of core-sand leakage to be issued to foundry supervisors.

(8) Any changes in operating procedure, or unusual occurrences were also to be recorded.

All information resulting from routine testing of the system sand was plotted on a control chart based on the methods given in "Statistical Methods in Research and Production" by O. L. Davies (published by Oliver & Boyd). The average value and the range value of the four daily tests on moisture, permeability and green-compression strength were plotted against a daily time base. Control limits (cf. Davies) were calculated at the end of each month and plotted on the chart. These limits were extended to serve as a guide for the following month. Briefly, the range values give an indication of what happens during the day, and the averages give an indication of what happens from day to day. Hence after a while it should be possible to anticipate changes in quality by study of the control chart.

When sudden changes occurred in the values plotted, then the system and its operating procedure were investigated to discover the causes of such changes, and when trends were shown on the chart, the procedure was altered so as to bring the trends under control, or to stabilize them at a new level.

Control Chart

The control chart is really composed of two charts, on which are plotted the average value of the daily samples, and the range between the highest and lowest values for each daily sample. "Warning" limits are plotted for both the chart of average values and the chart of range, such that one would not expect more than one in 20 of the results to fall outside these limits when the conditions are controlled (see Fig. 2).

The warning limits are readily calculated from the mean value of the averages and the mean value of the ranges, by methods explained in standard statistical textbooks. When more than one in 20 results fall outside the limits on the average chart then it is known that a shift in process average has occurred. When more than one in 20 results fall outside the limits on the range chart then a change in process accuracy has taken place. In either case appropriate action can be taken where required. The author recommends a study of the book previously mentioned for further information on this subject. The values for the factors mentioned, for the appropriate number of samples, were obtained from that source.

Facts Established

During the first twelve-month period the following facts were discovered:—

1. Hot sand was at times fed into the mill, causing loss of moisture with resultant loss of sand permeability and bond strength.

2. Random checks on moisture, permeability, and bond strength, taken because the chart showed uniform results over short periods, suggested that the sand-mill operator took greater care when he knew a routine test was to be taken.

TABLE I.—*Results Over Initial Twelve-month Period.*

—	Average range.	
	At start of control.	At end of first twelve months.
Moisture, per cent.	3.0–1.0	3.0 0.5
Permeability, No.	45–10	45–5
Bond strength, lb. per sq. in.	4.0–1.3	5.5–1.5
Grading (per cent.):		
36 mesh	2.0	2.0
36–52 mesh	7.0	4.0
52–72 mesh	28.0	12.0
72–100 mesh	22 0	16.0
100–150 mesh	16.0	28.0
150–200 mesh	11.0	24 0
200 mesh	5.0	6.5
Clay	9.0	7.5
Fineness No.	80 approx.	109 approx.

3. Improved methods of mixing new-sand additions could be used.

4. The daily number of routine tests was insufficient to prevent large variations between batches of milled sand.

Nevertheless during this period the quality of the sand had been considerably improved (see Table I); the range of moisture content had dropped from two to approximately one per cent., the permeability range from 20 to 10, the bond-strength level had risen from 4.0 to 5.5 lb. per sq. in. Although the range remained unaltered at from 2.5 to 3.0 lb. per sq. in., clay content had dropped from 9.0 to 7.5 per cent. and fineness had increased from 80 to 109 and grading shifted from the bulk of grains being of the order of 52, 72, 100, 150 mesh to being of the order of 100, 150, 200 mesh (see Fig. 2).

Control Procedure Developed

As a result of the experience of the first twelve-

month period, the following recommendations were adopted:—

(1) The storage hopper should be kept about one-quarter full, as experiment had shown that when it was empty hot sand was returned to the mill. Also when the hopper was full the sand did not circulate efficiently and hot sand was again returned to the mill.

(2) Routine sand testing, carried out by a trained operator, was increased from four to six tests daily. Hence the mill operator was kept more alert and the variations in sand quality were more completely covered.

TABLE II.—*Sand Properties at the End of the Second Period.*

	Average range.	
	At end of first twelve months.	At end of second twelve months.
Moisture, per cent.	3.0–0.5	3.1–0.1
Permeability No.	45–5	47–2
Bond strength, lb. per sq. in.	5.5–1.5	7.8–1.5
Grading, per cent.:		
36 mesh	2.0	1.5
36–52 mesh	4.0	3.0
52–72 mesh	12.0	9.0
72–100 mesh	16.0	7.5
100–150 mesh	28.0	27.0
150–200 mesh	24.0	36.0
200 mesh	6.5	10.0
Clay	7.5	6.0
Fineness No.	109 approx.	126 approx.

(3) Additions of new sand to be pre-mixed before loading into the rotary feed-hopper; with closer supervision applied.

(4) When large castings were to be made, new-sand additions were to be increased, in order to offset the heating of the system sand.

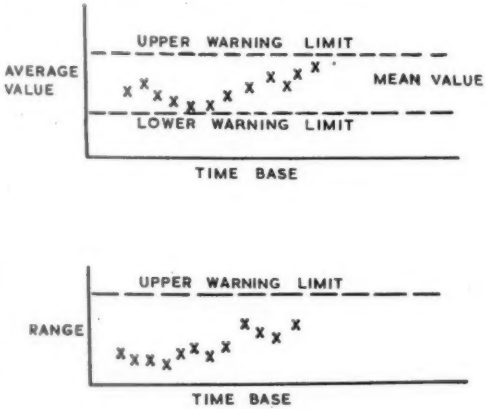


FIG. 2.—*Control chart for averages and ranges.*

(5) Moulding-sand gradings would also be charted, along with control grading calculated from the gradings of raw-sand batches.

When this revised procedure had been in operation for about twelve months the situation was again reviewed (see Table II). Moisture content was by then stabilized at 3.1 per cent. with a range of 0.2 per cent.; permeability was stabilized at 47 with a range of 4. Bond strength was not by then stabilized but its level had been increased to the order of 7.0 to 8.0 lb. per sq. in. and was being maintained at about this level by varying the amount of clay additions made at the sand mill and in the raw-sand additions. Clay content had been further reduced to 6.0 per cent. approximately, whilst the fineness was then of the order of 120 and the bulk of the grains were on mesh sizes 150, 200 and pan (see Fig. 3).

Conclusions

Close control of the operating procedure of the moulding-sand system, combined with regular testing and recording of sand qualities has enabled the aim of the investigation to be achieved; in addition the cost of running the sand plant has been slightly reduced. This is due to the fact that the clay content has been lowered, and the silica sand now employed is of a lower initial cost than that previously used.

Moulding troubles have been greatly reduced by providing a sand of more consistent quality. Casting finish has improved with the increasing fineness

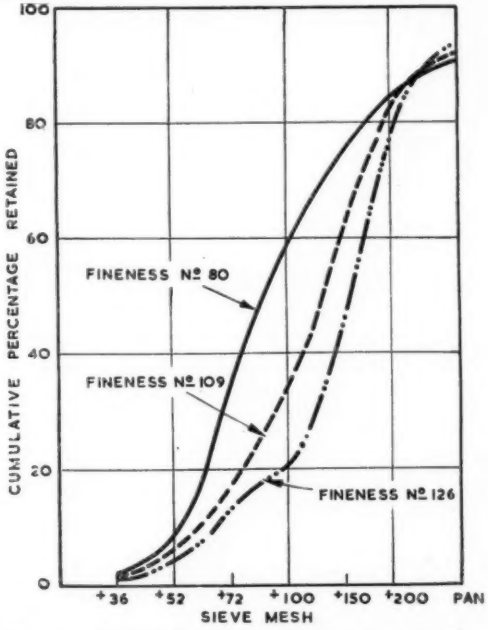


FIG. 3.—*Comparison of cumulative sand grading curves during the period covered by this report.*

of the sand, and various unsatisfactory conditions, such as inefficiency of the sand storage-hopper, mixing of raw sand, and leakage of coresand into the moulding-sand system, has been shown up.

It is felt by the author that although a number of these improvements would have occurred simply by virtue of closer control, the plotting of the results

Application of Quality Control to Sand

on a chart based on statistical concepts and the recording of unusual occurrences on that same chart, had led to the discovery of a number of factors which would otherwise have been missed, especially the leakage of coresand into the system sand, and the inefficient circulation of moulding sand in the storage hopper.

Acknowledgments

Grateful acknowledgement is made to the Glacier Metal Company, Limited, for permission to publish this work; to the operations research department of the company for assistance in planning the control chart and to Mr. H. T. Bidwell, A.I.M., foundry metallurgist, for assistance in preparing the report.

Metallurgical Abstracts

Load Cells for Weighing Molten Metal. ANON. (*Iron Age.* 1957. **180**; No. 12; pp. 148-9.) Electrical-load cells are being used for weighing hot-metal charges for open-hearth furnaces. The system uses four load cells, each with a capacity of 50 tons, and they support an I-beam platform on which the ladle rests. The operator controls the pouring of the hot charge in a booth at the side of the weighing platform. By watching the indicated reading on an instrument, the operator knows the exact weight of hot metal in the ladle at any point in the pour. The cells are positioned on pedestals in the bottom of the weighing pit, so they are above the reach of any but an exceptionally large and unlikely flow of metal in the pit. As the cells are 4 ft. 10 in. from the ladle and partially shielded by the I-beam platform, they are beyond the reach of direct overflow. As the cells weigh and register their readings electrically, their locations may be governed by safety requirements and convenience. The cells are sealed against moisture and are temperature compensated. The readings are transmitted by electrical impulse through cables and the system is impervious to errors caused by wear, incrustations of dirt, lubricants, etc. The four cells can weigh loads of about 25 tons. The use of a cell capacity so much larger than the load being weighed eliminates the need for automatic controls and safety interlocks. Weighing with this system is instantaneous, continuous, and accurate. An initial weight reads with an accuracy of 0.25 per cent. and repeated readings are accurate to 0.10 per cent.

Some Properties of White and High-alloy Cast Irons. J. H. CULLING and J. F. WALLACE. (*Materials in Design Engineering.* 1957. **46**; No. 2; pp. 99-101.) White and chilled iron castings, although they may be similar in composition, have properties that differ from those of the more familiar grey-iron castings. In un-alloyed chilled irons, the hardness, strength, and depth of the white-iron layer is regulated by composition, particularly the carbon content, and by casting conditions. The maximum hardness is obtained with a high-carbon content; lower hardness with improved strength and shock resistance is obtained with a lower carbon content. However, the low-carbon iron may have a tensile strength of 22 tons per sq. in., whereas the high-carbon iron has a strength of only 13½ tons per sq. in. Small additions of nickel, chromium, copper, and molybdenum, singly or in combination, are frequently made to un-alloyed chilled or white irons to improve their properties. In these low-alloy irons, combinations of nickel and chromium, or nickel and copper, can be adjusted to control the chill depth and increase hardness, strength, or service life. Small additions of chromium and molybdenum improve hardness, strength, and chill depth. Additions up to 1.5 per cent. Cr alone or in combination with up to 2.5 per cent. Ni, 0.6 per cent. Mo or 0.2 per cent. V have improved the service life of white and chilled irons. Additions of 3.0 to 5.0 per cent. Ni and 1.5 to 3.5 per cent. Cr produce a white iron having a much harder martensitic matrix structure, and these irons are considerably more wear resistant, stronger, and tougher than un-alloyed irons. Chilling refines the grain and further improves the mechanical properties of the alloy-white irons. Chromium alloys, containing from 10 to 30 per cent. Cr, and as much as 4.0 per cent. Mo, and modybdenum alloys, containing up to 12 per cent. Mo, show superior resistance to heat, abrasion, and corrosion. These alloys are also generally tougher and stronger than the un-alloyed grades.

New Patents

(Copies of complete specifications are obtainable from the Patent Office, Sales Branch, 25, Southampton Buildings, Chancery Lane, London, W.C.2, price 3s. 6d.)

783,427. Gebr. Bohler and Company, A.G., 14 Elisabethstrasse, Vienna, 1, Austria.

A method of continuous casting, particularly for metals of high melting point, in which the melt in the chill mould is set in rotation about its axis.

783,461. Regie Nationale des Usines Renault, 8-10 Avenue Emile Zola, Billancourt (Seine), France.

The production of large castings from cast iron graphitized by annealing. What is claimed to be novel is that if the cast iron also contains small quantities of denitridizing agents such as zirconium, aluminium, or titanium, and if it is then subjected to a triple treatment of marsenitic quenching, tempering and nucleation, then graphitization at high temperature, it becomes easy and rapid to obtain the complete decomposition of the primary cementite into fine nodules of graphite in a pearlitic (or possibly sorbitic) part. Especial reference is made of this to the production of crankshafts but may, of course, be used for other massive castings.

783,472. Th. Goldschmidt A.G., 15 Hellermannstrasse, Essen, Germany.

The improvement in the casting of bronze-alloys by the inclusion of between 0.05 and 5 per cent. of misch-metal. Primarily it prevents the lead from "oozing" to the surface of the alloys.

783,517. Mannesmann A.G., Mannesmannufer, 1b, Dusseldorf, Germany.

The continuous casting of metals with especial reference to the prevention of porosity.

American Letter

Land of Contradictions

Considering metal prices in the US, copper is at its lowest price since 1950, lead since 1947, zinc since 1947, tin since 1955, and iron scrap since 1955. The following "now and then" nominal US prices are interesting:

—	Dec., 1957.	Dec., 1956.	1947 (avg.).
	Cents per pound.		
Copper	27	26.0	21
Lead	13.5	16.0	14.6
Zinc	10.0	13.5	10.5
Tin	89.6	112.5	78.0
Aluminium	28.10	27.1	15.0
Magnesium	36.0	36.0	—
	Dollars per 2,000-lb. ton.		
Pig-iron	70.51	67.76	39.34
Steel scrap	33.00	61.17	41.00
Cupola scrap ..	39.00	53.00	51.00
Coke	29.50	28.50	17.00

Some measure of the present US industrial depression is shown by the following figures for unemployment:

	Nov./Dec., 1957.	Year ago.
Employed	65,500,000*	66,200,000
Unemployed	3,188,000	1,900,000

* Approximate.

Yet when considering personal possessions, a measure of the standard of living is reflected in the news that in the US automobiles exceed the number of households; in other words, for the first time in motor-car history, the number of cars registered to run on US roads exceeds the number of households in the country. Three households out of four have at least one car at their disposal. The statistics (reported by *US News*) are:

	No. of cars on the road (millions).	No. of households (millions).	Families.	
			With cars (millions).	Without cars (millions).
1945 ..	25	38	—	—
1950 ..	37	45.7	27.4	18.3
1957 ..	51.6	51.2	38.7	12.5

Conferences Past and Projected

The Electric Furnace Steel Conference which was held (under the auspices of the American Institute of Metals Engineering) in Pennsylvania, USA, last month included a session on foundry practices at which a number of important papers were read. Chairmen of the session were Mr. J. W. Tibbets, assistant works manager, Canadian Steel Foundries (1956), Limited, of Montreal and Mr. N. H. Keyser, assistant chief, process metallurgy, Battelle Memorial Institute, Columbus, Ohio.

The first paper presented was "Oxygen as an Aid in Electric Furnace Melting" by Mr. G. Tracey, melting superintendent of Canadian Steel Foundries (1956), Limited, Montreal. A further contribution on the same subject was made by Mr. V. E. Belusko, casting metallurgist, and L. E. Fink, metallurgist, Electric Steel Foundry, Portland, Oregon. A pre-printed paper "Some Aspects of Melting Low-temperature High-impact Steels," followed and was given by Mr. W. A. Koppi, melting superintendent, Lebanon Steel Foundry, Pennsylvania.

On the subject of spectrographic analysis in the foundry, three contributions were made:— "Fluorescent X-ray Spectrographic Analysis" by Mr. Earl Anger, chief metallurgist, Duralloy Company; "Standardization and the Use of the Spectromet in a Steel Foundry," a pre-printed paper by Mr. C. L. Richards, vice-president, metallurgy and research, Adirondack Foundries and Steel Inc., and Mr. H. Levesque, sales manager, Baird Atomic, Inc.; and finally "The Quantovac—A Direct-reading Instrument for the Control of Carbon, Phosphorus, Sulphur and other Important Elements in Iron and Steel," by Mr. H. W. Calkins, Pittsburgh district representative, and Mr. M. F. Hasler, president of Applied Research Laboratories, Pittsburgh.

The National Open Hearth Steel and the Blast Furnace, Coke Oven and Raw Materials committees of AIME are to hold their combined conferences at Cleveland, Ohio, from April 14 to 16, 1958, and advance plans have already been made for the occasion. The Open Hearth Conference is to commence with a paper on the "History of Steelmaking" by Mr. L. F. Reinartz, a past-president of AIME.

Papers to be presented include contributions on basic foundry practices. The concluding session will be of interest to both blast-furnace and coke-oven operators and is to include papers on iron, coke, the history of the blast furnace over the last 40 years and, finally, a panel discussion on blast-furnace performances.

Midlands Industry Report

The Midland Regional Board for Industry has reported that unemployment in the Midlands has begun a slight downward curve and production in the region is being maintained; the Board, however, views the turn of the year "with some concern." Major C. R. Dibben, chairman of the Board, said: "We feel that the restrictions and restraint under which industry today must operate, may bring about a fall in production and employment in the New Year. There is a general feeling of concern but we prefer to use the word concern rather than apprehension." Mr. J. W. Eldridge, regional controller of the Ministry of Labour, said that the November total of unemployment was 21,766—1 per cent. of the national working population compared with the national average of 1.5 per cent. Furthermore, the number of short-time workers in the region now stood at only 2,900, though a year ago it was 24,000.

Mr. Michael Halls, regional controller of the Board of Trade, said that the Canadian Trade Mission which visited the Midlands recently, had been greatly impressed by the achievements of UK industry, its vigour, its improvements in production techniques and fundamental research and by the "good housekeeping." Some members of the Mission thought, however, that the vigour should be matched with stronger salesmanship in Canada. He went on to say that "The ultimate value of the Mission will depend on whether we follow it up properly both here and across the Atlantic. The Mission will be spreading the view throughout Canada that the UK is obviously a first class source to purchase goods. But it must be followed up thoroughly."

FOR THEIR NEW FACTORY at Grimsby, Courtaulds, Limited, have placed a contract worth £80,000 with Thompson Bros. (Bilston), Limited, for the supply of fabricated stainless-steel vessels and aluminium storage tanks.

Nickel Industry in 1957

Dr. John F. Thompson, chairman of the International Nickel Company of Canada, Limited, states that the supply of nickel has now overtaken demand. The company produces 75 per cent. of the nickel available to the free world, and as 40 per cent. was used for defence purposes in 1956, and this last year declined to 30 per cent. an extra amount was made available for civilian consumption. Dr. Thompson made the following remarks as to foundry consumption:—

Non-ferrous alloys containing high percentages of nickel, such as the Nimonic and Inconel nickel-chromium alloys maintained their position throughout the world as standard materials for use in components for aircraft gas turbines; the Monel nickel-copper alloys were again employed throughout the industry for a wide variety of corrosion-resisting applications, and in the atomic field, the plants for the extraction and refining of uranium and the utilization of atomic energy continued to make wide use of the corrosion-resistant properties of nickel-containing stainless steel and Inconel, Monel and pure nickel.

Industry continued to recognize the advantages gained through the use of nickel as an alloying agent to improve the properties of cast irons. Production of Ni-Hard abrasion-resisting nickel-chromium cast irons showed an increase during 1957. The mining and cement industries continued to be the principal users of these alloys in grinding balls and mill liners for grinding ores and cement in North America, the United Kingdom, Europe and elsewhere. Ni-Resist corrosion-resisting nickel cast irons have become important in heat-resistant applications involving turbo-charger and other diesel engine components. A large use of these alloys continues in castings for corrosive service, although increasing interest is being shown in their application for high-temperature service.

The development of new and improved nickel-alloys having special magnetic properties continues to meet the constantly expanding scope of the electronic and instrument industries in the production of automation, computation and communication equipment. Although the development of devices such as transistors supplements these nickel-alloys in many fields of application, the general expansion made possible by all of these materials provides an enlarging market in this field. There has been a further expansion in the application of nickel-containing high-tensile aluminium-bronze for large marine propellers.

Rebuilding Scheme Completed

From their new offices and works in Friar Park, Wednesbury, the directors of Smith & Davis, Limited, steel and brass founders, can look back on 17 years' progress which started from "scratch." In 1940 their factory in Hospital Street, Birmingham, was levelled in the blitz. A year later one of the temporary buildings was completely demolished by a delayed-action bomb. Recently the company, founded in 1901, celebrated the completion of its £100,000 rebuilding scheme at Friar Park. Works buildings were put up seven years ago, and three years ago the offices were begun.

Post-war development will not stop at this point. The firm has started a further £60,000 extension to the works for lacquering, plating and annealing shops. The several hundred employees produce metal articles for the building, plumbing and general trades. So the factory which, during the war, operated from seven different addresses has again settled as a single unit.

Babcock & Wilcox, Limited's £4,000,000 Scheme

Plans to raise some £3,800,000 by a debenture issue and a rights offer of ordinary stock are announced by Babcock & Wilcox, Limited. Treasury consent has been obtained. The debenture issue will be for £2,000,000 nominal to be offered to existing debenture, preference, and ordinary stockholders on terms and conditions to be announced shortly. The rights issue will be of 1,881,099 £1 ordinary shares at par on the basis of one new share for every £4 ordinary stock held on December 27.

Referring to the need for additional funds, the chairman, Mr. W. Lionel Fraser, points out that the directors are arranging to lease the Ordnance factory at Dalmuir (Dunbartonshire) and have approved development programmes for the group's subsidiaries and overseas interests. Despite the retention of a substantial proportion of earnings, financial resources are insufficient to meet present capital commitments and the increased working capital needed.

Last year's profits are expected to be similar to those for 1956. An interim ordinary dividend of 7 per cent. has already been paid and the directors expect to recommend the payment next June of a final of 6¼ per cent. on the increased ordinary capital. These payments will be equivalent to approximately 13 per cent. in a full year on the increased ordinary, and the directors expect to pay ordinary dividends totalling 13 per cent. for 1958.

Significant benefits from the new expenditure are not expected in the immediate future and it is even possible that there may be a period of somewhat lower earnings, the chairman states.

New Hire-purchase Legislation

New legislation came into force on January 1, to help customers buying goods on an instalment basis to see exactly what terms are being offered by the shopkeeper advertising detailed hire-purchase facilities. It is the most recent addition to other Acts already passed to protect customers committing themselves to hire purchase or credit sale agreements.

Under the new Act, traders advertising hire-purchase or credit-sale facilities are obliged to set out full particulars of their basic terms if they wish to give details of either the deposit or of the instalments which they are prepared to take. This means that they must normally state in such an advertisement, in addition to the cash price, the down payment, the instalments (size and number) and the period of repayment. They must not stress unduly the more attractive items in the terms of payment and they must distinguish clearly between the terms they offer on hire purchase and those offered for a credit sale. Penalties of up to £100 may be imposed for failing to observe the Act which applies to England, Wales and Scotland.

(It is considered that the Act may have the effect of diverting some hire-purchase business to such articles as gas and electric cookers, fires, etc., and thus be of indirect benefit to manufacturers of these items—Editor.)

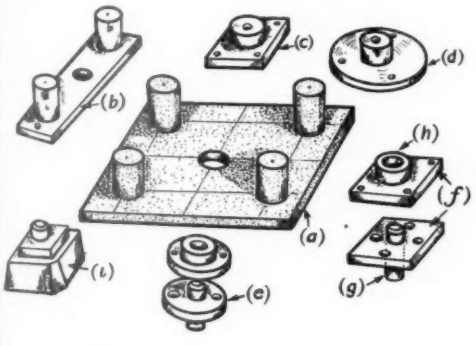
* Copies of the Advertisements (Hire Purchase) Act, 1957, are obtainable from H.M. Stationery Office, Kingsway, London, W.C.2. and branches, price 6d. (by post 8d.).

A MOSCOW REPORT states that Soviet pig-iron output is to be more than doubled in the next 15 years. Production of iron ore last year was 84,000,000 tons.

Pattern Details in Cast Iron

By "Jacques"

The use of metal inserts in the larger types of wooden patterns and coreboxes can save much patternmaking labour when applied to form intricate sections which would otherwise require much tooling to develop the shape required—particularly in cases where the run of brackets, bosses, pull-in and -out pieces repeat themselves in the layout of the job. An example of this is in the patternwork for a heavy unit such as a diesel cylinder or crankcase. Here, design details follow each other closely from the two- to an eight-cylinder block casting. However, it is not suggested, nor indeed is it advisable that metal inserts be used for all types of wooden patterns. But there is no doubt that if such inserts are visualized and planned at the start of making equipment, they can add to the rigidity and strength of the pattern structurally. Moreover, where power lifts are necessary in the coremaking and moulding routine, the extra half-hundredweight or so due to the inserts is of no disadvantage.



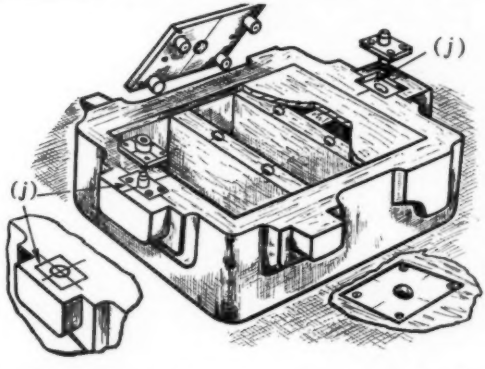


FIG. 1 (*left*).—*Various designs of rapping plates and* FIG. 2 (*right*) *showing how spigots take the "rap" from the rapping bar and tidger.*

Materials

Aluminium is of course the first choice as material for the inserts, but although it has the virtues of lightness and strength, this excellent material does add considerably to the cost of pattern and coreboxes, though this can be offset to some extent when long repetitive orders are received for a given design. With small orders, or perhaps for designs of uncertain permanency, the cost of aluminium for inserts is prohibitive. Moreover, where a patternshop has no easy access to an aluminium foundry, delay and other contingencies are liable to enter into consideration.

Cast-iron inserts, on the other hand, can be made in such a manner as to require practically no filing or other final preparation and where the negative process of making shell-patterns is followed, the difference in weight between solid aluminium and cast-iron shell-type inserts is negligible and the saving in cost will be obvious, as also will the inconveniences.

Shell-type cast-iron inserts withstand rough foundry usage better than any other material, for it is not difficult to visualize the fate of thin-sectioned wood or soft-metal inserts where core irons are employed—which of necessity have a rough shape and conform to a rigid section with projecting points at various angles. Such core irons require careful fitting and checking before being used.

This article is compiled and illustrated from actual examples developed from war-time expediences adopted when supplies of anything but of the ordinary in a foundry was virtually unobtainable by the "little man," and quality of components also left much to be desired.

Years of experience now show that many procedures which were makeshifts during the war are permanently established in certain directions, so the ideas may be worth noting. Fig. 1 shows a series of rapping plates as applied to the heavier type of loose patterns. When the plates are made in cast iron—to a variety of shapes and thicknesses to suit individual needs—the rapping holes do not "burr" up as they do with mild-steel plates. The centre sketch (*a*) shows a typical improvized pattern for a plate, made from a flat piece of core and four short lengths of round core for the spigots, one at each corner, fixed in place with a dab of core-jointing paste. Extruded round core is usually exact for diameter and can be matched precisely to a joiner's "bit." Sketch (*b*) shows a narrower two-spigot rapping plate, (*c*) a single one, while the round type, shown at (*d*), is a useful one for bush patterns and the like.

"Taking the Rap"

It will be found that, where these projecting

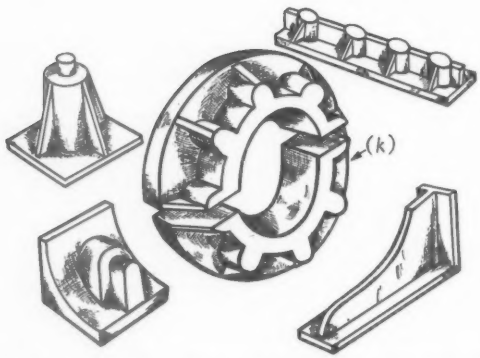


FIG. 3.—*Outer sketches show four examples of sections of a corebox and pattern in which similar details repeat themselves. The centrepiece, made in the shell cast-iron manner, can be seen at (r) in Fig. 6.*

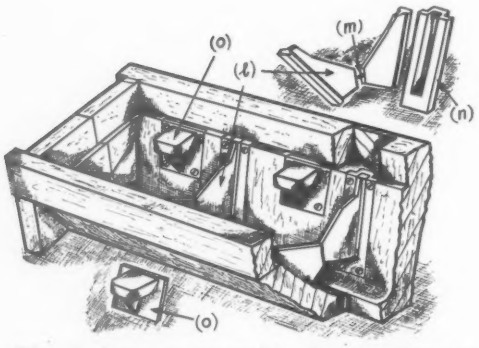
spigots are put into any substantial section of a pattern, long service is assured because the spigots take the "rap" from the rapping bar and tidger easy register for matching on a similar diagram drawn on the matching part. This is shown at (*j*) Fig. 2.

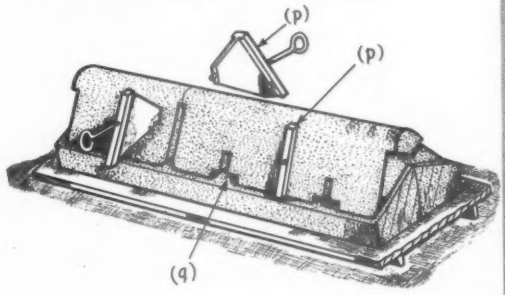
As with rapping plates, the spigot in each case (and not the screws) takes the load. Substantial dowel plates and pegs are easily made on the "flat back" of the pattern. These may be made as a cover core using a cover-core corebox to suit, as shown at (*i*) Fig. 1. This method ensures parallelism of pin and spigot. The spigot on the hole plates is not necessary for wear but is added to simplify fitting and marking out.

Sectional pieces in cast iron seem the logical answer to the thin or more heavily sectioned parts of a corebox and pattern, where bosses, brackets and similar features repeat themselves. The outside sketches in Fig. 3 show four examples which, when made in wood, deteriorate rapidly due to heavy core-iron fitting, hand-ramming and so on.

Fig. 4 shows part of a corebox with brackets and other details which repeat themselves in a row in the complete corebox. Made in cast iron, the thin draw-out parts (*l*) permit the use of a dowel-pin and hole (*m*) which keeps the two separate pieces in correct position and alignment during the ramming-up. They are moreover immune against

FIG. 4 AND 5.—*Left, part of a corebox with brackets and other details which repeat themselves in a row. Fig. 5 (right) shows part of a core turned out from this corebox.*

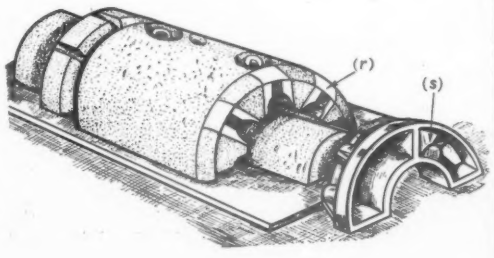




(Fig. 2 shows an example). Patternmakers will usually co-operate in planning these plates and if a piece or two of flat core and a length of extruded round core are available, made as shown, these can be quickly reproduced in cast iron.

Substantial easy-to-fit dowel and hole plates for the larger type of split patterns are not exactly "four a penny" and with certain designs leave much to be desired. Sketches (*e*) and (*f*) in Fig. 1 show two types of cast-iron dowels and plates; dimensions of 1-in. dia. and about 1-in. long are ample and being made short, the dowel pegs cannot easily be broken off. The dowel peg (*g*) is, of course, truly parallel both sides of the plate. For a 1-in. dia. peg, a 2-in. dia. spigot (*h*) provides an

FIG. 6.—*The use of heavy "densener" chills is seen here at (s).*



core-iron damage. Six in a row can be produced from one master wood-pattern to each type; the bearing unit at (*n*) will be noted.

Fig. 5 shows part of a core turned out from this corebox, the draw-out parts being of cast iron (*p*) do not develop the grain-roughness which is often found with the wooden type. The castings are more dimensionally accurate; the cast-iron brackets (*o*) draw away alike cleanly and easily. Cast-iron pieces also seem to be indispensable for those draw-out sections—so necessary on certain designs—which have to be left in place during the drying. The centre piece (*k*) in Fig. 3 is made in the shell cast-iron manner as shown in another view at (*r*) in Fig. 6. In many cases, heavy "densener" chills are used such as shown at (*s*) in Fig. 6. By leaving the cast-iron section behind, these chills can be rammed up in place before drying the core in the usual way. This is an advantage because such heavy items would otherwise have to be placed in position afterwards. It will be seen that where eight or more halves of a core to a set are required, half a dozen at least of these cast-iron shell-type inserts are necessary. From one solid master wood-pattern as at (*k*) Fig. 3, these cast-iron "shell"-type formers can be reproduced quite easily by the method described here and require practically no after-fitting and polishing. It can be very instructive to check over a set of heavy patterns and coreboxes after long use and to note the advantages of cast-iron inserts over those made of wood.

SHEFFIELD AND DISTRICT IRONFOUNDERS' ASSOCIATION held their annual meeting and luncheon at the Grand Hotel, Sheffield, last month, under the chairmanship of the president, Mr. S. B. Rippon. Guests included Mr. E. Illingworth, chairman of the East and West Ridings branch of the Ironfounders' National Confederation, and Mr. C. L. Carver, secretary.

BECAUSE of the serious state of New Zealand's overseas exchange position, all future imports will be subject to licensing and trading banks will not allocate exchange to importers unless a licence is issued by the Customs department. Among British goods which may be affected are iron and steel, electrical and telephone apparatus, and cars and commercial vehicles.

Thin-walled Magnesium Casting

The Chance Vought Aircraft, Incorporated, concern of Dallas, Texas, USA, has recently made what is claimed to be the largest thin-walled magnesium casting ever executed in one piece. This casting (shown in Fig. 1) weighs 150 lb., and is reported to be playing an important role in the construction of the company's latest Regulus II guided missile. It was designed in co-operation with the casting vendor, R. H. Osbrink Manufacturing Company of Los Angeles, and is made to the (American) AZ-63 ACS material specification. The casting forms the "air scoop" of the missile which is now powered by a J-79 jet engine. Often called a "sugar scoop" for obvious reasons, the component not only supplies engine air, but includes ducts to "bleed-off" a portion of the boundary layer air into openings under the wings.

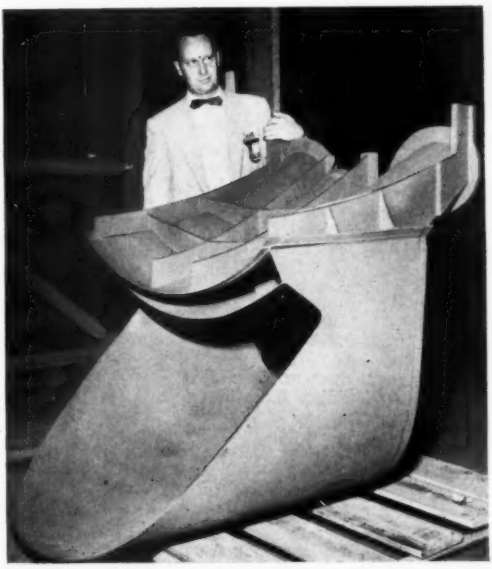
Programme

The original castings drawings were issued almost two years ago but owing to the late change to the J-79 engine, a major modification in the air-scoop lines and a considerable amount of new pattern work was necessary before the job went into production. Despite this setback, the first casting was poured in May, 1956.

The mould is 6-ft. high and for its manufacture 10 tons of sand were required. A special elevator had to be constructed in the floor of the vendor's plant so that the mould could be lowered during the pouring operation. The nominal thickness of the walls and webs is 0.24 in. and the solid leading-edge tapers to 0.015 in. cast radius. Casting tolerance is $\pm$ 0.03 in. on dimensions up to 12 in., with an additional $\pm$ 0.002 in. per in. on dimensions above that.

The weight of this casting is slightly less than the 159-lb. Regulus I wing outer-panel casting produced by the same vendor, but the scoop is of much more complex design. To complete the boundary layer bleed system, for the Regulus II scoop, six additional magnesium castings totalling 43 lb. are joined to the air-scoop ducts.

FIG. 1.—*Front view of the air-scoop single-piece magnesium casting produced for the Chance Vought Aircraft concern's Regulus II guided missile.*



Law Case

Redecoration Neglected

A firm of founders was fined £5 recently in respect of a charge of failing to clean and redecorate their foundry, to which a plea of "guilty" was entered. It was alleged by the prosecution that pipes and roof trusses in the foundry were festooned in dirt and dust and that according to the company's records the necessary work had not been done in the foundry since 1951.

H.M. Inspectorate of Factories, who prosecuted, said that the proceedings were brought under the Factory Act which required the walls, etc., in factories to be kept clean. If the walls were painted with oil-paint or varnished, it was required that they should be washed down not less than once in every 14 months and re-painted or re-varnished every seven years. It was also laid down that accumulations of dust and rubbish, etc., should be removed regularly.

For many years foundries were outside the scope of the Act as regards that section of it, but as a result of the Garrett report the exemption was withdrawn. According to the register which was required to be kept, the premises had not received the prescribed attention since 1951. The matter had been taken up by the District Factory Inspector with the management of the firm, and there had been a long correspondence on the subject. While it was not expected that a foundry could be kept as clean as some of the other departments, quite a high standard of cleanliness could be achieved. The section of the Act was a health section and had not been designed to make foundries look attractive, but to safeguard the health of the workers. He asked that in addition to any penalty that might be imposed, the bench should make an order requiring the work to be done within a certain period.

Replying to questions, the prosecuting inspector agreed that one of the serious dangers to health in the foundries came from flying particles of dust and that there was a general reluctance on the part of the men to wear the respirators provided. He agreed that he had no actual evidence of a man's health being affected by the dirty state of the walls. He did not accept the view that the cleaning and re-decorating could only be done when the foundry closed down. He knew of other foundries where the work was done while production was in progress. Answering further questions, he said that he was aware that the firm was to instal a dust-extractor plant in the foundry, at a cost of some £8,000. He added that he had received every help and courtesy from the company in the course of his inquiries.

The firm's representative admitted that an offence had been committed. The firm had three factors to take into consideration—production, the welfare of the men and deliveries to their customers. The welfare of the men was dependent on production, and no one wanted to see short-time working. For more than 80 years the foundries were outside the scope of that regulation and the state of the wall, etc., had been regarded as a necessary evil, and less injurious to the men than short time. The foundry was not an old derelict building, but was one which was built in 1951. The firm had arranged for the dust-extraction plant to be installed and if the cleaning and re-decorating were done before that was put in, much of the work would have to be done over again.

It was stated that 200 men would be laid off work if the necessary work were carried out at any other than summer-holiday time; the Bench ordered the work to be carried out not later than August 31, 1958.

Foundry Modernization*

Modernization and extension of plant at the Cardiff Foundry and Engineering Company, Limited, has increased productivity and raised weekly potential output from 40 to 70 tons.

Extension of the floor space to twice its area was carried out in two stages. The construction of several annexed buildings running the full length of the main plant to deal with pre- and post-casting operations has cleared the foundry for moulding, core-making, casting and knocking-out, and made it possible to split the work into three main groups—heavy moulding, machine moulding, and high-speed repetition casting. The third section is fully mechanized with a conveyor unit made up of 88 casting plates and served by four jolt/squeeze machines. These machines and two Sandslinger machines for large moulds are automatically fed with sand through hoppers from an overhead conveyor.

At one side of the foundry there are seven large mould- and core-drying stores equipped with thermostatically-controlled coal-fired heating.

Monorail Gantry

Three cupolas are in use alternately. Molten metal from a cupola runs *via* chutes into ladles suspended from a monorail gantry in the main foundry. The ladles are used for direct pouring into moulds on the main conveyor or for supplying hand ladles used on the floor. Molten metal for large moulds up to 10 tons is poured into ladles which are carried to the working area by an overhead electric gantry crane.

After casting, sand falls through the shake-out grid on to a conveyor which takes it to the reclamation unit, where it is lifted by bucket conveyors to a 50-ton hopper. Fine dust is drawn out by suction into a wet-dust arrester outside the works.

At the base of the 50-ton hopper a hand-controlled rotating table directs the sand into one of the two conveyor belts delivering to either of the mixing mills; electrodes ploughing through the sand in the conveyor check moisture content. From the mills the sand is fed to the main overhead conveyor from which it is directed to the hoppers of the machines below.

Sand-blasting has been scrapped in favour of a Wheelabrator consisting of two rotary tables, each of which can cope with up to two tons of castings for shot-blasting. Whilst one table is in the shot-blasting chamber, the other is loaded outside. Shot is reclaimed through a grid in the chamber floor and collected by an underground conveyor which feeds it back to the hopper via a lift convevor.

Furnaces are automatically loaded from a 40-bucket carousel conveyor. Spring suspension of the buckets from the conveyor gives automatic weighing of each load.

With better quality control and reduced fatigue, operative performance has risen and average earnings are up by about one-third.

* Reprinted from *Target*.

Wage Increases in November

During November about 495,000 workers had wage increases amounting to some £147,000 a week. Up to the end of November, 12,104,500 workers had received wage increases in 1957 and the weekly wage bill rose by £5,164,500. For the corresponding period of 1956, 12,430,000 received wage increases amounting to £6,506,000 a week.

There were fewer industrial disputes in November than in October and working time lost amounted to 85,000 days. If the December figure is similar the aggregate for 1957 will be about 8,440,000 days.

Investment-cast *v.* Wrought Steels

Australian Discussion discloses Controversial Matters

Written discussion published in the Proceedings *of the Australian (Victoria) branch of the Institute of British Foundrymen, which makes interesting comparison between investment-cast and wrought steels, is reproduced in what follows. It forms comment on a paper given by Mr. R. H. Dyke and Mr. T. Fitzgerald, presented to the branch last year, which gave a preliminary survey of the properties of investment-cast plain carbon steels.*

In the contributions received since the paper was given, several of the Authors' statements have been challenged and their reply to some of the comment is printed. It would be interesting to learn if the views quoted are representative of those held by investment casters in Europe and elsewhere, and an invitation is extended by the Editor for others to contribute.

The written discussion under review commenced with the remarks of MR. K. H. BELCHER, Department of Defence Production, Melbourne, who said:

The authors have suggested that by modifying steel composition it should be possible to match the mechanical properties required from a particular wrought steel. In this connection it is considered pertinent to look at the field of application of investment castings and to consider various ways of producing castings suitable to the design engineer.

With some notable exceptions, as for instance in the case of complicated shapes made from very hard materials, investment casting is ultimately selected as a manufacturing tool on the basis of cost. Insofar as application to small steel fittings, etc., is concerned, it may be used in two ways: (*a*) it may be initially selected as the manufacturing method with component designed accordingly, or (*b*) be selected as an alternative to machining from a forging or bar stock. With (*a*) no more than the usual production difficulties should arise provided that initial design considerations are sound. But in the case of (*b*) considerable difficulty may occur if the purchaser insists upon obtaining full equivalent mechanical properties (particularly elongation and impact resistance as measured by the Izod test). It is, of course, understood that in many applications a designer requires full properties and variations will not be permitted.

To achieve identical properties (with particular reference to elongation as determined by a standard room-temperature tensile-test) it appears that the only course is to modify steel composition. Whilst initially this may appear to be the most desirable line of action, it is suggested that in certain instances consideration should be given to accepting the cast equivalent of the wrought material.

Elongation Factor

Design engineers will probably agree that there are many components which are of a functional rather than a stressed design and, as such, would be satisfactory with a slightly lower elongation. It follows that there are many components in which elongation is not a real factor in performance, but rather a criterion of steel-quality and control during manufacture. However, although the investment casting may have a slightly lower elongation, this should not be construed as lower inherent steel-quality. As a development of this, it is suggested that when attempts are being made to use investment casting as a production tool in lieu of machining from a forging or bar stock, consideration should be given to accepting a component cast in identical material, *i.e.* one having the same tensile strength but with reduced elongation.

Should this not be acceptable to the designer, then obviously two courses are open: (*a*) to modify composition to achieve full mechanical properties, (*b*) to prohibit the use of an investment casting. Advantages to be gained from using the same steel composition are:—(1) Ease of production and less likelihood of control difficulties which could arise during alloying of small quantities of steel—say up to 30 lb. (2) Reduction in cost. (3) Possible reduction in alloy consumption. (4) Rationalization of steel types.

It is therefore suggested that the USA approach might be followed, at least for the low-alloy high-tensile engineering constructional steels. The USA procedure in the main is to draw up specifications for the cast form of existing wrought material with slightly modified carbon, manganese and silicon limits to allow for variations during remelting, and for the slightly lower elongation normally expected from cast material.

Suggested Procedure

Relating all this to the starting point, *i.e.* the drawing, the following procedure could apply:—(1) Make new drawings to call for the appropriate material specification, quoting properties against a specific composition. (2) When changing over from fully-machined to investment-cast components: (*a*) specify the cast equivalent to the wrought material in cases where the designer will accept slightly lower elongation; (*b*) when full mechanical properties are essential, call for a higher grade of material, *i.e.* modify steel composition.

It thus appears that the first need is for a series of specifications having regard to the cast equivalents of existing wrought compositions. In this connection, it is suggested that, having looked into the fundamental difference between the properties of wrought and investment-cast steels, consideration might be given to the idea of including in the current investigational programme a series of parallel tests on wrought and investment-cast

Investment-cast v. Wrought Steels

material with the object of establishing a parallel set of specification minima values.

The second need is, unfortunately, somewhat more difficult for mere metallurgists and that is to get engineering and inspection authorities to agree to use this new series of specifications applicable to investment castings!

The authors in their reply say that they agree in general with the above remarks. They comment:—It must be remembered that, because of the generally smaller production runs in Australia, the relative economics of various production methods may differ considerably from those overseas.

Further comment was made by Mr. H. E. Arblaster and L. J. Stone, both of Commonwealth Aircraft Corporation Pty. Limited, Melbourne, who said:—It is pleasing to see work of an original nature published on investment casting. We would, however, make observations upon (*a*) the deductions concerning the relative strength of investment cast and wrought compositions, particularly as to the interpretation which may be placed upon them by design engineers who are contemplating the use of investment castings, and (*b*) the introduction of certain hardenability concepts into the authors' interpretation and discussion of their results.

Investment Castings and Wrought Products

It is considered that it is in the interest neither of engineering practice nor of investment casting production that an unrealistic impression should be given of the properties of the latter, particularly in comparing them with wrought products of the same composition. The producers of investment castings most certainly do not benefit from an uninformed substitution of cast for wrought products, if this results in failure to realize the expected properties, and so the investment-casting process is saddled with a failure, when, in actual fact, the real cause is a wrong application and an incomplete appreciation of the properties themselves.

The undisputed field of investment castings is the manufacture of awkward shapes to a high accuracy which is difficult, if not impossible, to achieve by other methods when, for instance, dimensional tolerances of the order of ±0.001 in. per in. are required.

TABLE I.—*Chemical Requirements for Investment Castings.*

S.A.E. Grade.*	Chemical composition.				
	C.	Mn.	Si max.	P max.	S max.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
0022	0.12–0.22	0.50–0.90	0.60	0.05	0.06
0030	0.30 max.	0.70 max.	0.60	0.05	0.06
0035	0.25–0.35	0.50–0.90	0.60	0.05	0.06
0050	0.40–0.50	0.50–0.90	0.60	0.05	0.06
0090	—	—	—	0.05	0.06
0105	—	—	—	0.05	0.06
0120	—	—	—	0.05	0.06
0150	—	—	—	0.05	0.06

* Grades 0022, 0035 and 0050 are intended to be plain carbon steels. The other grades are usually low-alloy steels in which the composition, other than phosphorus and sulphur requirements, may be at the option of the manufacturer. The analysis of grades 0090, 0105, 0120 and 0150 are subject to agreement between producer and user.

The unmachinable compositions investment cast into intricate shapes of great accuracy constitute another field for the effective application of the technique.

The user of investment castings and the design engineer really want to know the minimum guaranteed properties and few specifications are extant. However, the Society of American Engineers Handbook 1956 p. 188 lists the chemical composition and mechanical properties of investments castings as shown in Tables 1 and 2. There are a number of American Materials Specifications dealing with investment castings, *e.g.* AMS 5333, 0.5 per cent. Cr, 0.55 per cent. Ni, 0.2 per cent. Mo, 0.11-0.17 per cent. C, and AMS 5334, 0.5 per cent. Cr, 0.55 per cent. Ni, 0.2 per cent. Mo.

TABLE II.—*Minimum Physical Properties of Investment Castings.**

S.A.E. grade.	Tensile strength.	Yield point.	Elongation in 1 in.	Reduction in area.
	Tons per sq. in.	Tons per sq. in.	Per cent.	Per cent.
0022	—†	—†	—†	—†
0030	29.0	15.6	20	30
0035	31.3	16.1	22	30
0050	38.0	20.1	16	30
0090	40.2	26.8	18	40
0105	46.9	38.0	15	35
0120	53.5	44.6	12	30
0150	67.0	55.8	8	22

* Tensile properties are based on test specimen having gauge length of 1 in. and diameter of 0.020 in. † Not required.

It will be seen from the foregoing that there are a number of American specifications available to the engineer. However, the general advice to the user of castings as a vital part is to proof test initial castings and so ascertain if they in fact do the job.

The conclusion that hardened and tempered investment-cast steels have similar strengths to wrought steels, but lower ductility and impact strengths, is not questioned in substance, but it is felt engineers may fail to realize its full implications.

Testing Initial Castings

First, it is not helpful to compare a casting with a wrought product on the strength basis, because the association of the words of "wrought" and "strength" immediately brings to mind all the attributes of a wrought product. Castings are used as castings, not as test-bars, and strength values are obtained from test-bars.

Mr. S. C. Churchill's[1] remark, "Investment-cast steels retain all the undesirable characteristics which hot-working eliminates" is quite sobering. In the practice of making and supplying investment castings this is offset by tight and regular control of process at all stages and, in some cases up to 100 per cent. X-ray inspection. If foundries are not prepared to do this, there will undoubtedly be non-uniformity of product with consequent variations in service life. Thus engineers will become prejudiced as they were (or are) against sand castings. Foundrymen, having brought this on themselves, for years did nothing about it. The amount of ductility required for a given application may be debatable as is the value of the Izod, but it should be emphasized once more that the best way to form an opinion is to proof-test initial castings—a well established aircraft industry practice.

Concerning fatigue of wrought and cast steels, Evans, Elbert and Briggs[2], who compared endurance

limits of a number of compositions both in wrought and sand-cast form, found that, by and large, casting surfaces could be regarded as notched rather than smooth-surfaced test-specimens, but perhaps not so severely notched as the specimen deliberately machined with a notch.

Hardenability

It is unfortunate that the authors saw fit to introduce hardenability doctrine of any kind into their work. Although it is widely practised in America, English experts have never accepted hardenability, and in 1946 a symposium[3] was published containing much careful and exhaustive work which stressed this fact. Personal enquiry supplemented by private communications, indicate they are now if anything, even more disinclined to regard it with the same seriousness as do the Americans. The system of British alloy-steels described in BS.970 is not based on any hardenability concept, nor is any particular percentage of martensite at the centre taken as an aim.

Excluding grain size, hardenability is a compositional effect which reveals nothing about grain shape and it is doubtful if the results are dependent on the ability of the grains adhering together to form a strong polycrystalline aggregate. It is suggested that if the authors intend to study strength developed in a given section, they should adopt the "tensile hardenability"—that is, to heat-treat the specimen in the full-section size it is desired to study and from it cut the test piece. The value of their work would be considerably enhanced if they leave hardenability doctrine out of their future work.

Replying, the authors comment:—Mr. Arblaster and Mr. Stone disagree with the approach of the authors in that they apparently consider that the properties of investment-cast steels can be considered as being lower than those of comparable wrought steels. However, as pointed out in the paper, there has been very little detailed work published on the properties of these steels and this paper was the first of a series aimed at providing this detailed information.

They also appear to have misunderstood the title of the paper which throughout deals with the properties of investment-cast steels, not with investment castings. The relationship between design, porosity and properties would have to be studied separately. It is difficult to see how they decide that investment castings can be regularly produced with "an accuracy of the order of ± 0.001 in. per in." To the authors' knowledge, no such claim has ever been made by any competent worker in this field. It is generally recognized that the minimum tolerance which can be held in practice is ± 0.005-0.007 in. on small dimensions, and that this accuracy decreases with increase in dimensions.

The term "hardenability" was used by the authors in its original sense, *i.e.* "the ability to harden." The preliminary tests detailed in this paper were used only to compare the relative abilities of the steels to harden, not to determine strengths at internal levels. The main objection to the extension of the American hardenability concept arises from the derivation of properties other than hardness from hardness determinations. The authors have no intention of carrying out such derivations.

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[1] S. C. Churchill, "Mechanical Properties of Alloy Steels in Investment Castings," *Engineering*, Feb. 6, 1953, 164.
[2] E. B. Evans, L. J. Ebert, C. W. Briggs, "Fatigue Properties, Comparable Cast and Wrought Steels," A.S.T.M. 1956, Preprint 64.
[3] "Symposium on the Hardenability of Steel-Iron and Steel." Institute Special Report 36 (1946).

Cleveland Bridge & Engineering restore Final Dividend

In view of the improvement in the business of the Cleveland Bridge & Engineering Company, Limited, coupled with the fact that the end of the Australian difficulties is in sight, the final dividend is restored to 5 (2½) per cent., tax free, making a total of 6½ (4) per cent. The year's trading profit, etc., to September 30, 1957, is £163,526 (£146,328), and net profit £77,145 (£32,217).

On the two Australian contracts, the directors state that the bridge over the Georges River at Liverpool was opened to traffic recently and work there should be completed in a very few months. Work is expected to be completed towards the end of 1958 on the bridge at The Split, Middle Harbour.

ICI acquire Colliery Explosives

As a result of an approach from the directors of the Colliery Explosives Company, Limited, Newton-le-Willows (Lancs), Imperial Chemical Industries, Limited, has acquired the whole of the issued share capital (consisting of 108,000 shares of £1 each) of that company.

The new subsidiary, which manufactures various commercial blasting explosive compositions, will be administered by the Nobel division of ICI.

Water-gas Plant for Holland

A £50,000 contract to supply "labourless" carburetted water-gas plant of 1,750,000 cub. ft. daily capacity for the Haarlem Gas Undertaking, Holland, has been awarded to Humphreys & Glasgow, Limited, London, S.W.1. The plant will be designed for the reforming of refinery or natural gases. It will be completed ready for operation by November, 1958. The new plant is self-clinkering and is designed to recover steam from waste heat.

The company installed a similar plant at Haarlem in 1952. Automatic controls enable that plant to be operated by a single man. No additional labour will be needed when the new plant is installed, both plants being controlled by the same single operator. Humphreys & Glasgow has just completed another carburetted water-gas plant, also of 1,750,000 cub. ft. capacity, at Delft, Holland.

EMPLOYEES of the Standard Motor Company, Limited, Coventry, have received a personal letter from Mr. Alick S. Dick, the managing director. With it went a copy of the statement by the chairman, Lord Tedder, to stockholders. In his letter, Mr. Dick announces the introduction this year of a monthly works newspaper which will be edited by Mr. Frank McDonagh, a former shop steward, who for the past year had been the company's industrial relations officer.

Company News

WEYBURN ENGINEERING COMPANY, LIMITED—The final ordinary dividend is 25 per cent. (same plus a bonus of 2½ per cent.), making 30 per cent. for the year ended October 31, 1957, against 32½ per cent. for 1955-56. Net profits fell to £39,162 from £63,834 after tax of £72,359 (£95,112).

GREEFF-CHEMICALS HOLDINGS, LIMITED—The directors announce that 193,966 of the 200,000 5s. ordinary shares provisionally allotted to ordinary stockholders on November 4 were accepted. Applications for excess shares up to and including 40 shares have been met in full and a ballot held for the remainder in parcels of 40 shares.

SMITH'S DOCK COMPANY, LIMITED—Schemes for extensions and improvements to the fitting and other shops at both North Shields and South Bank have been approved at an anticipated cost of about £425,000. For the year ended September 30, the net profit was £421,985 (£413,313), and no change is being made in the 15 per cent. dividend.

HEAD, WRIGHTSON & COMPANY, LIMITED—An interim dividend of 5 per cent. is being paid by the company on the £1,771,875 ordinary capital, as increased by a 50 per cent. scrip issue in respect of the year ending January 31, 1958. A final of not less than 10 per cent. has been predicted. On the former £1,181,250 ordinary the interim for the previous year was 7½ per cent. and the final was 15 per cent.

H. J. ENTHOVEN & SONS, LIMITED, lead smelters and refiners and metal merchants, of London, E.C.4—The directors were unable to authorize the payment of the final dividend of 3¼ per cent. for 1957 on the 7½ per cent. cumulative preference shares, which was due on January 1. The company, they say, has incurred losses on its stocks owing to the steep fall in metal prices and has encountered difficult trading conditions.

REDPATH BROWN & COMPANY, LIMITED, structural steel engineers and iron and steel stockholders, of Edinburgh—Trading profits for the year ended September 30, 1957, advanced to £1,393,303 (£1,189,814). After deducting tax of £783,347 (£842,333), net profits emerged at £546,787 (£293,203). The value of contracts completed during 1957 was "substantially" higher than in 1956. The order-book is not so heavy as a year ago, but is sufficient to keep all works fully engaged throughout the present financial year.

SIR GEORGE GODFREY & PARTNERS (HOLDINGS), LIMITED, makers of aircraft air-conditioning and industrial equipment, etc., of Hanworth (Middx)—The total value of the order-book has further increased and the readjustment of the defence programme had not had too serious an effect as the company was well established in other fields. The group profit, before tax, rose to £688,426 (£521,333) for the year to August 31, 1957. Having regard to the present economic situation in industry, the dividend is being held at 22½ per cent.

ATLAS STEEL FOUNDRY & ENGINEERING COMPANY, LIMITED—The chairman, Mr. A. C. Strathie, looks forward to a reasonable return for the immediate future, but cannot promise a repetition of the results for the year to September 30, 1957, when there were some special features. While the flow of orders coming into the industry has been gradually decreasing, the company had sufficient on hand to keep it reasonably employed for some time. Trading profits increased from £136,667 to £225,026, and net profit, after tax, from £45,925 to £70,896. The dividend is raised from 1s. 10d. to 2s. 1d. per 5s. stock unit.

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference ESB can be obtained from the Board of Trade Export Services Branch, Lacon House, Theobalds Road, London, W.C.1 (telephone: CHAncery 4411, ext. 738 or 771), unless otherwise stated.

BLACKPOOL, January 16—Supply and delivery of double spigot spun-iron pipes. Specifications, forms of tender, etc., from the Illuminations and Public Street Lighting Officer, Illuminations and Street Lighting Department, Rugby Road East, Blackpool.

BOLIVIA—The Yacimientos Petroliferos Fiscales Bolivianos, Casilla 401, La Paz, are anxious to obtain catalogues, technical details and specifications, and price lists for various types of safety and other equipment. Among the products in which they have expressed interest are:—belts, gloves, goggles, boots, lamps, protective masks against acids, gases, infra-red rays, smoke and dust; safety equipment: alarm installation systems; asbestos protection for production lines; fire-fighting equipment for storage tanks, refineries, oleoduct terminals, storage plants and service stations; personal security equipment; water purification plants; ventilation equipment, etc. (ESB/30770/57.)

BOROUGH OF MANSFIELD, February 1—Requirements for stores include iron castings (manhole and gully fittings) (serial No. 5). Specifications, schedules, etc., from the Borough Engineer and Surveyor, Carr Bank, Mansfield (quote serial number).

IRISH REPUBLIC, January 31, 1958—Construction of a lake intake and causeway, filter house, sludge lagoon, wash water tank, reservoirs, etc., with the laying of supply and distribution of mains and including all meter chambers, valves, hydrants, fountains, etc., in accordance with the contract documents. (ESB/30811/57.)

KOREA, January 17—Requirements are:—19 heavy duty dump trucks with spare parts.

PORTUGUESE EAST AFRICA, January 17—Requirements are:—30 lots comprising 2,138 tyres for locomotives, including rough tyres for driving and coupled wheels of locomotives, tender wheels, pony truck and bogie wheels, and for rail cars. (ESB/30459/57.)

SINGAPORE, January 15—Requirements are:—55 items of malleable cast iron pipe fittings including: nipples, bends, reducing bushes, plugs, equal sockets, backnuts, reducing sockets, reducing tees, pipe brackets and pipe straps. (ESB/31277/57.)

SUDAN, January 20—Controller of Stores, Sudan Railways, Atbara, has invited tenders for the supply of 150 tons of copper, high grade, fire refined, minimum purity 99.88 per cent., in ingots. (ESB/30912/57.)

UNION OF SOUTH AFRICA, January 17—Requirements are:—2,100 automatic couplers, "S" type, complete, but without coupling pin, 8 in. × 6 in., cast steel, side pull, bottom operated, to S.A.R. Drawing CME.68/10709-478/A and Specification CME.19/1955. 1,270 automatic couplers (T type), complete but without coupling pin to Drawing No. CME.68/10714—478B. Issuing authority—Stores Department, South African Railways.

UNION OF SOUTH AFRICA, January 31, 1958—Requirements:—(1) Two five-ton (11,200 lb.) capacity, 3 ft. 6 in. gauge, diesel-mechanical, jib cranes, arranged for self-propulsion as well as haulage; recommended spares for these, detailed price list to be submitted with tender. (ESB/30874/57.)

WIMBOURNE MINSTER, February 10—Provision and laying of spun-iron pipes. Applications for the specification, Bill of Quantities, and form of tender, to W. Herbert Bateman and Partners, Chesterfield House, Batheaston, Bath.

Changes of Names

Among companies which have recently changed their names are those listed below. The new titles are given in parentheses.

TRACTORS (SWINDON), LIMITED, Stratton Road, Swindon (Tractors & Farmaids, Limited).

METALLURGICAL CONSULTANTS, LIMITED, 75, Charles Street, Sheffield, 1 (Bowkers, Limited).

SOUTHERN SCREWS, LIMITED, Dallas Works, Gore Road, New Milton, Hants (Southern Waste, Limited).

HUXLEY ENGINEERING & WELDING COMPANY, LIMITED, 35, John Street, London, W.C.1 (Ketherstons, Limited).

DAVIS & HODDER, LIMITED, 171c, Battersea Park Road, London, S.W.8 (Hodder Engineering, Limited).

NORTHERN SMELTING & CHEMICAL COMPANY, LIMITED, 9, Basinghall Street, London, E.C.2 (Conzinc Investments, Limited).

SUTOR, LIMITED, boot and shoe machinery, etc., manufacturers, of 133, Sandon Road, Stafford (Sutor Engineering, Limited).

KNOWSLEY CAST METAL COMPANY, LIMITED, Titan Works, Trafford Park, Manchester, 17 (Knowsley Securities, Limited).

HARRISON & HINCHLIFFE (BRISTOL), LIMITED, 123, Victoria Street, Bristol, 1 (Harrison Engineering (Bristol), Limited).

Production of Nodular-graphite Iron from Sardinian Ores and Charcoal Fuel*

The term "nodular-graphite cast iron" denotes that after the solidification of the iron, its graphite is in the spheroidal form rather than in the form of flakes. Normally appearing in ordinary cast iron, this change from flakes to spherulites of graphite results in an improvement in the tensile strength and toughness, and a reduction of brittleness. The heat-treatment of an iron containing nodulizing agents consists in a short-time reheating at temperatures between 800 and 900 deg. C., in forced-air-circulation tunnel furnaces which ensure a high degree of temperature uniformity. The use of s.-g. iron has expanded rapidly within a period of a few years owing to its special characteristics which have enabled it to be employed in a variety of applications as substitute for normal cast iron, malleable iron, and steel.

Composition

The chemical composition of pig-irons destined for the production of nodular irons must fulfil certain conditions in order to ensure the nodulizing reaction and obtain castings possessing special mechanical and technological characteristics. The iron used as the base material should have a composition within the following limits:—C, 3 to 4 per cent.; Si, 1.5 to 2.5 per cent.; Mn, <0.5 per cent.; S, <0.05 per cent.; P, <0.05 per cent. The carbon content should not be too low, because this would preclude the possibility of using steel scrap during remelting in the foundry. If the silicon content is too low, ferro-silicon must be used for the remelting. A deficiency of silicon may be compensated by the presence of copper or nickel. In this connection it is estimated that 3 per cent. Cu or Ni is equivalent to 1 per cent. Si.

The manganese content has no effect on the process itself, but has an influence on the mechanical and structural characteristics of s.-g. iron. If a ductile iron is required it is necessary to have a very low manganese content; values higher than 0.5 per cent. Mn can be allowed if one desires a cast iron with a pearlitic matrix. Sulphur must be as low, for the higher the content of this element, the greater addition of a nodulizing agent (Mg) is necessary, because a part of this addition will combine with the sulphur, thus lowering the efficiency of the process. Although a phosphorus content of up to 0.05 per cent. has no damaging effects on the process, it is preferable that the content of this element be as low as possible, because its presence in the nodular iron reduces ductility. That is to say that the presence of a high phosphorus content in s.-g. iron tends to nullify, at least partially, the effects obtained by the nodulization.

Furthermore, a high-grade pig-iron destined to be nodulized must be free from Cr, V, Ti, Pb, Sn, As and Al. The percentages of chromium and vanadium must be very low because these elements counteract the nodulizing reaction by forming carbides which tend to occur in a network distribution and impair the mechanical properties of s.-g. iron. The content of titanium as well as those of other impurities should be less than 0.04 per cent.

Production of Pig-iron for S-g. Iron

Pig-irons used for the production of nodular cast iron have been obtained, up to now, directly from the blast furnace, and the only harmful impurity encountered was titanium, the content of which was often as high as 0.06 per cent. The oxidizing process in the Bessemer converter was therefore employed to reduce this element. This process tended to reduce strongly the carbon content; at the same time the silicon was practically eliminated, and it was therefore necessary to add 75 per cent. ferro-silicon before casting in order to ensure the required percentage of silicon in the iron. By using this method, the titanium content is maintained below 0.03 per cent. The electric furnace, on the other hand, offers the possibility of directly producing good, desulphurized pig-iron suitable for the nodulizing process.

To obtain a pig-iron with the silicon content between 2.5 and 3.5 per cent., the voltage was kept at a low level, and the slag composition maintained within the following ranges:—SiO_2, 30 to 32 per cent.; CaO, 46 to 48 per cent.; Al_2O_3, 10 to 15 per cent.; MgO, 2 to 4 per cent.; FeO, 0.3 to 0.6 per cent.; Mn, 0.1 to 0.2 per cent. A too acid slag (SiO_2>40 per cent.) makes the process very turbulent, this being accompanied by the ejection of the slag.

A basic slag, having a high fusion temperature, is often very viscous and promotes phenomena similar to those which are associated with acid slag. Basic slags are evidently best, but when ores containing more than 20 per cent. SiO_2 are employed, the quantity of slag involved is so great that the economics of the process are jeopardized.

The production of electric pig-iron involves a high consumption of charcoal, the exact figure depending upon the characteristics of the process employed. In the electric furnace the reduction takes place in an open shaft and there is contact between the charcoal and the atmosphere; owing to its reaction with oxygen, the charcoal is therefore particularly exposed to losses.

At the Cagliari works of the SAEM, Sardinian ores were reduced in a three-phase electric furnace, rated at 2,000 kva., using a voltage of 100 v. and 10,000 a,, which was equipped with an automatic Tagliaferri regulation system and Söderberg electrodes of 600 mm. diameter.

* Abstracted from *Journal du Fons Electrique*

Production of Nodular-graphite Iron

The irons produced are as follow:—

Type of pig-iron.	C, per cent.	Si, per cent.	Mn, per cent.	S, per cent.	P, per cent.
High-grade hematite ..	3.5 to 4.0	1.4 to 4.0	<0.6	<0.03	<0.04
Nodular ..	3.0 to 3.8	1.5 to 2.0	<0.4	<0.03	<.004
Malleable ..	3.3 to 4.0	0.6 to 1.2	<0.5	<0.04	<0.04

In carrying out the reduction operations, the labourers' time required per ton of iron is about 18 hrs. The consumption of Söderberg electrode paste was, on average, 16 kg. per ton of iron produced. Iron is tapped into ladles and subsequently cast into pigs of about 15 kg., the slag being granulated in water.

Corrosion of Air Pipelines

Describing an investigation into the corrosion of compressed-air lines, Dr. Franz Eisenstecken* affirms that it is essential to galvanize as well as to paint the insides of air pipes, even if the compressed air is cooled. Drops of water are bound to condense from the air, particularly between October and March, since it would be prohibitively expensive to cool compressed air below the winter outside air temperature. Reagents have recently been injected with some success into long pipelines, to inhibit corrosion of the bore.

Investigations were undertaken on compressed air cooled by two methods: (*a*) by an aftercooler, (*b*) by direct contact with a water spray, either salt, ground water, or spring water. The condensate was analysed at various points, the main draw-offs being immediately after cooling, and 1,100 yd. inbye. The amounts of insoluble residue left on the filter increased with the distance from the compressor to a maximum of about 33 milligrams per litre, almost entirely Fe_2O_3. Simultaneously the *p*H-values rose from about 4.5 to 6.0. This reduction of acidity and increase of iron oxide in the condensate was caused, it was assumed, by the condensate attacking the pipeline.

Injection of Alkaline Solution

Since neither of these cooling processes was found to prevent corrosion, the idea of making the cooling spray alkaline was proposed. This was rejected because the calcium and magnesium compounds in the water would be precipitated in alkaline solution, and would rapidly fur-up the cooler. Alkaline solution was therefore injected into the 5,000-yd. long pipeline, which was mainly underground, and carried 38,000 cub. ft. of air per minute. The pipe was heavily corroded and the condensate *p*H-value was 5 before injection. The injection, carried out at a single point near the compressor, raised the condensate *p*H-value to 8.5, even at the inbye end of the pipe. One early result of this improvement was the loosening of rust in the pipe, so that larger quantities of rust were drawn off in the condensate.

Bituminous coatings on the galvanized bore of new pipes have been satisfactory, provided the surface has been effectively cleaned. Before they are galvanized, pipes are descaled, if less than 24-in. dia., by a pickling process, or if larger by sand-blasting. If the sand grain-size is kept down to 0.5 to 1 mm. the sand-blasted steel surface is smoother than when blasted with coarser grit, the irregularities having a height of about 20μ with this sand size, and about 80μ with grit, measured from the bottom of the depressions to the top of the projections. Fine sand is therefore recommended. Meticulous cleaning is essential before any sort of painting, and the surface must be dry. Therefore, the primer must not be sprayed, but should be brushed on; the spraying process is liable to deposit condensed water on the surface.

The overall thickness of the dry bituminous film should be about 180μ (0.18 mm.). The thickness can nowadays be measured electromagnetically without damage to the film, with a tolerance of about 10 per cent. These magnetic testing devices cannot be used with paints containing ferromagnetic material. A thickness-measuring device should be available at every works, affirms the author, to measure paint film thicknesses, not only in compressed-air pipelines, but elsewhere. A manufacturer's statement of the large covering capacity of a paint, though apparently attractive, can often be taken as a warning, since it may be obtained by a high content of thinners which evaporate and contribute nothing to the dry film.

The author also stresses the importance of a compatible painting system, of the dryness of each coat before the next is put on, particularly with bituminous paints, and of insistence on the final dry thickness of 180μ. The cost of paint materials is 35 to 40 per cent. of the total, the labour cost of cleaning the surface and applying the paint being 60 to 65 per cent. In mine shafts, it is reported that corrosion of the inner surface of steel tubbing, particularly in downcast shafts, can be serious. Some 10-mm. thick steel tubbing, installed for 25 years, was corroded inside to a maximum depth of 2.2 mm. in a downcast shaft. Conditions are usually better in upcast air. The outer face in contact with concrete is not usually corroded, being protected by chemical combination with the lime in the concrete.

* Abstracted from *Glückauf*.

Pig-iron Output

The drop of 4,000 tons in the weekly rate of pig-iron production in November compared with that of the previous month confirms the impression that current demand has been overtaken and imports are no longer necessary. For the first 11 months of last year the aggregate output of pig-iron has risen 8.7 per cent. above the 1956 tonnage and this has been achieved with a smaller number of blast furnaces in operation.

Bigger and more efficient blast furnaces are now employed and it is the policy of the industry to continue this process of substituting new furnaces for older units of limited capacity.

Graduate Course in Foundry Science and Engineering

One of the characteristic features of post-war industrial development is the increasing contribution made by scientific ideas to the development of industrial processes. The universities are playing no small part in this development and one of their important contributions is the expansion of post-graduate training. At present Great Britain is the only leading industrial country without advanced university training in metal founding. In Germany, for example, about 20 graduates are trained in metal founding at Aachen each year, and it is known that a similar type of training is given in the United States, France and Russia.

It is now proposed to establish a graduate course dealing specifically with foundry science and engineering; it will not compete with the course given at the National Foundry College at Wolverhampton, rather its aim and scope will be complementary to those of the Foundry College. The course will be of nine months' duration leading to a diploma in graduate studies, or one year's duration leading to a M.SC. degree, and present plans are that it shall be held every two or three years. During the intervening years similar graduate courses will be held in other fields of industrial metallurgy.

The basic idea underlying the planning of the syllabus is that the course should provide post-graduate training in which the fields of foundry science and foundry technology are carefully balanced. Students will also have the advantage of close contact with research teams active in the field of melting and casting of metals.

Syllabus

General

The broad aim of the course is to provide advanced university training in the combined fields of foundry science and engineering. The course assumes prior training in metallurgy, science or engineering up to degree standard. Depending on their prior qualifications students will be admitted to a diploma or to a M.SC. degree course. The candidates for a M.SC. degree must possess a first degree of the required standard.

Lecture courses will be arranged to meet the requirements of those students taking the full one-year course. However, one or two brief lecture courses on selected topics will be arranged over short periods in such a way that they could be also attended by extra-mural students. Such short courses will be advertised in the daily and technical Press. In addition to the lectures given by the full-time university staff, some lectures will be given by leading authorities in research organization and in the foundry industry. The subject matter of the lectures will be arranged in such a way as to outline the basic principles, but will deal mainly with advanced scientific knowledge and applications. For the benefit of those candidates who have not had adequate training in metallurgy, arrangements could be made for them to take suitable additional courses during their post-graduate year.

Full Degree Course

This course has been planned to include eight to ten lectures per week. The remaining time will be used for laboratory work, seminars, discussions and works visits.

Winter Term

(1) *Physical chemistry of melting processes. Principles and applications:* Brief review of basic concepts. Chemical reactions in metal-melting systems. Slags and fluxes. Control of impurities including hydrogen, oxygen, carbon, sulphur and phosphorus. Combustion of fuels. Protective atmospheres. (Formal lectures about 20 hours.)

(2) *Metallurgy of melting and casting:* The liquid state and its properties. Solidification: volume changes, nucleation, crystal growth, segregation. Zone melting. Cast structures: types, properties, stresses, defects and methods of control. Flow of metal in gates. Heat transfer during solidification and application to risers. (20 hours.)

(3) *Properties, developments and uses of casting alloys:* Zinc, aluminium, magnesium, copper and nickel base alloys. Cast irons and steels. (12 hours.)

(4) *Physical, mechanical and other methods of testing:* Test bars and castings. Deformation and failure. Developments in mechanical, optical, magnetic and X-ray techniques. (12 hours.)

(5) *Applied statistics:* Basic concepts. Applications to foundry processes and methods of control. (10 hours.)

Spring Term

(1) *Melting furnaces and processes:* Flame and electric furnaces for non-ferrous metals. Cupolas. Steel melting. (9 hours.)

(2) *Casting of non-ferrous and steel ingots:* Developments in batch and continuous methods of ingot casting. (6 hours.)

(3) *Sand founding:* (*a*) Foundry sands: base and bonding materials. Sand preparation, plants and methods of control. (*b*) Moulding: patterns, moulds and cores. Gates and risers. Fettling and finishing. (*c*) Foundry plant and layout: moulding and core-making machines. Mould drying. Ventilation. Mechanical handling and layout. Application of time and motion studies. Progressing. (*d*) Castings: design, properties, defects, heat-treatment. Inspection and control. (46 hours.)

(4) *Metal mould and specialized founding:* Gravity, pressure, precision and centrifugal founding. (8 hours.)

(5) *Production engineering and management:* This course will be arranged in co-operation with the production engineering department of the University to meet special requirements of students in foundry processes. (23 hours.)

Summer Term

(1) Refractories (5 hours), and (2) recent developments in foundry technology, *e.g.*, pressure, shell and CO_2 moulding. Special foundry techniques in nuclear engineering. Founding of titanium alloys. Automation in the foundry. (10 hours.)

Ancillary Arrangements

Laboratory Work

Laboratory and workshop facilities are available in the Aitchison Laboratory for practical work illustrating many aspects of the lectures. The programme of work will include set exercises as well as individual projects in research and development.

Seminars and Works Visits

Students will be required to read papers on various topics of the course and related subjects. Works visits combined with discussions will be arranged to foundries and research establishments.

Part-time Courses

One or two selected topics from the course will be arranged to run over short periods so that they could be attended jointly by full-time students and by suitably

Foundry Science and Engineering Graduate Course

qualified personnel of the foundry industry. Such an arrangement would create an opportunity for exchange of views and ideas on current theories and practice of metal founding. These courses will be advertised in the usual way.

Degrees

The basic course of lectures and practical work is planned to be completed by a full-time study in three terms beginning early in October. Full-time students would proceed to a Diploma or to a M.SC. degree. The former will qualify through an examination held in June, whilst the latter, in addition to the above examination, will have to prepare a dissertation on a selected subject. This work may be completed by the end of September.

Fees and Scholarships

The inclusive fee for the course is £81. In certain cases where a student is not sponsored by an employer, the University will consider applications for remission of this fee and where necessary for the grant of a maintenance allowance during the period of attendance.

Information and Registration

Forms of application may be obtained from the Registrar, the University, Edgbaston, Birmingham, 15, and further information about the course from the secretary of the Department of Industrial Metallurgy at the above address.

The staff of the Department of Industrial Metallurgy at Birmingham is headed by E. C. Rollason, M.SC., PH.D., F.I.M., Professor of Industrial Metallurgy, supported by V. Kondic, PH.D., D. V. Wilson, PH.D., M. G. Cockcroft, PH.D., H. J. Pick, PH.D., and J. Wilcock, PH.D., as lecturers, Leslie Aitchison, D.MET., as honorary research Fellow and T. Broom, PH.D., D. R. Milner, M.SC., and B. Russell, B.E., as research Fellows.

Ferro-Enamels' Extensions

The 8,000 sq. ft. extension to the Ferro Enamels, Limited factory at Wombourn, Wolverhampton, is now nearing completion, and will house one of the most up-to-date colour-oxide plants in Europe. The total cost of new plant and equipment is £75,000 and output is expected to increase by 400 per cent. The calcining furnaces installed have been designed and constructed by the firm's own engineers with a view to ensuring uniformity of each batch of materials processed—a vital factor when temperatures in the order of 1,300 deg. C. are being controlled and when repeat supplies of individual colours must be exact matches with those furnished earlier.

Special vacuum filters are being installed to remove any contaminating salts while the colour is still in the liquid state, *i.e.*, prior to drying and final processing. Machines have been so positioned in the new layout as to enable consecutive operations to be carried out automatically without any time lag. Also to be housed in the new building is the colour-matching laboratory where the initial trials will be carried out to formulate desired colours before the process for their manufacture on a production basis is handed over to the appropriate department. Extensive mechanical handling, in the form of hoists, overhead conveyors, lift trucks, etc., has been arranged to eliminate manual work as far as possible and special attention is paid throughout to accurate process control from the raw-material stores to despatch department.

DSIR Research Reports

The Department of Scientific and Industrial Research has recently issued a further list of Research Reports. Amongst the subjects covered, those of interest to foundrymen are recorded in the brief synopses which follow:—

*PB.*121604: *Production of Castings in Titanium*: This Report describes the types of melting furnace, mould materials, and alloys that are used in preparing cast titanium parts. No suitable methods have been found for measuring the temperature of titanium melts before they are poured from the melting furnaces. Consequently, superheat in the melts is measured indirectly by the electrical power consumed after the titanium becomes molten. Titanium and titanium alloys cast to date have strengths approaching those of wrought titanium alloys. The ductility of the cast alloys, however, is somewhat lower. (As a microfilm this Report costs 11/6 and as an enlarged print, 57/6.)

*PB.*122609: *Investigation of the Inert-gas Arc-welding of Aluminium using Helium Gas:* The comparative advantages of helium and argon gases for the inert-gas arc-welding of aluminium alloys with alternating currents are described. Each gas appears to have individual characteristics which make it preferable for a given application. The peculiarities of weld deposits on 61ST6 aluminium-alloy using A1 43 filler metal are discussed and data relative to the characteristics of the weld deposits are presented. (A microfilm of this Report costs 8s. 9d. and an enlarged print 43s. 9d.)

*PB.*121540: *Properties of Moulding Sands under Conditions of Gradient Heating:* A new hot-strength test has been used on moulding and core sands. This test differs from the conventional isothermal test in that it reproduces in a compression test-specimen the thermal gradients that surround a solidifying casting. A compression strength *vs.* temperature curve obtained by this gradient heating method was relatively smooth and showed a continuous decrease instead of the sharp peaks and valleys characteristic of a curve obtained by the conventional test. Various moulding- and core-sand mixtures were tested under conditions which represent mould interface regions for castings that solidify in the vicinity of 1,090 to 1,380 deg. C. (Price 3s. 6d. as a microfilm and 17s. 6d. as an enlarged print.)

*PB.*123245: *Synthetic Sands for Steel Moulding.* Several variables producing inaccuracies in sand-test results are studied and recommendations are made for avoiding or minimizing these variables. A study of a fine synthetic moulding sand over a wide moisture range is made with other sands shown for comparison. Other points investigated are the effect of silica flour when used to "close up" a sand, the effect of bentonite and sand grain-size on the surface finish of steel castings and the effect of the relative humidity of the atmosphere on dry-sand strength. (Cost 6s. 6d. and 32s. 6d. for microfilms and enlarged prints respectively.)

The Reports are available for inspection at the Technical Information and Documents Unit, Cunard Building, 15, Regent Street, London, S.W.1, they may also be borrowed without charge, or copies or photo-copies for retention may be obtained from the above address at the prices quoted. Payment should not be made at the time of ordering.

FIFTEEN EMPLOYEES at the Scotstoun Iron Works of Mechans, Limited, Glasgow, have been presented with long-service awards.

News in Brief

ASSOCIATED LEAD MANUFACTURERS, LIMITED, is to erect smelting and refining shops at Skinnerburn Works, Newcastle-on-Tyne.

WILSON PIPE FITTINGS, LIMITED, is planning to build extensions to the foundry and machine shop at Fordneuk Street, Glasgow, S.E.

THE SIXTH FACTORY EQUIPMENT, HEATING, VENTILATION AND THERMAL INSULATION EXHIBITION is to be held at Earls Court, London, from April 14 to 19.

IT IS EXPECTED that part of Derby's new College of Technology, now being built on a site at Kedleston Road, Derby, will be completed by next Christmas.

WATSON & COMPANY (BOLTON), LIMITED, Sharples Vale Foundry, Astley Bridge, Bolton, Lancs, is planning to build works premises on an industrial estate at Manchester Road, Bolton.

DOVER ENGINEERING WORKS, LIMITED, have removed their London office from 68, Victoria Street, S.W.1, to Talbot House, Arundel Street, W.C.2. The new telephone number is COVent Garden 0834.

THE FOURTH INTERNATIONAL AUTOMATION EXHIBITION AND CONGRESS is to be held at the New York Coliseum from June 9 to 13. Details are available from Richard Rimbach Associates, 845, Ridge Avenue, Pittsburgh, Pa., USA.

THE DAILY MAIL IDEAL HOME EXHIBITION, which is to be held at Olympia from March 4 to 29, is to show a large collection of pictures and furniture from the National Trust Properties, to be sent from country mansions all over the country.

Mr. K. J. PALMER, the London manager of Birlec, Limited, has recently spent three months studying Canadian economic conditions, and deems the future to be bright for British manufacturers. There is now a possibility that his company will not only sell in Canada, but may also manufacture furnaces there.

NEWTON CHAMBERS & COMPANY, LIMITED, Sheffield, are to establish a library to help apprentices with their training. Money left by the late Mrs. Newton Drew for the benefit of apprentices will enable this to be done. Mrs. Drew was the widow of Mr. Walter Newton Drew, a former chairman and managing director of the company.

Mr. D. J. GUILD, has recently joined the staff of Armstrong Whitworth (Metal Industries) Limited, and Jarrow Metal Industries, Limited, as technical representative, and has been appointed to their Midlands area. There, he will assist the companies' Midlands manager, Mr. J. Bell, and will operate from their offices at Somerset House, Temple Street, Birmingham 2.

A 16-MM. SOUND FILM on the 6-cwt. capacity carbon-rod resistor furnace installed at the British Steel Castings Research Association's experimental foundry has been made by the Association's film unit. The 15-minute film describes in detail the construction and operation of this steelmaking furnace. It is available to non-members of the Association on payment of a hire charge of £5 5s.

SINCE January 1, the London office of the Pulsometer group is Pulsometer House, 20/26 Lamb's Conduit Street, W.C.1, 'phone: HOLborn 1402. The group comprises: Pulsometer Engineering Company, Limited, Joseph Evans & Sons (Wolverhampton) Limited, Skyhi Limited, of Isleworth, Self-Priming Pump and Engineering Company, Limited, of Slough and G. S. Tett & Company, Limited, of Feltham.

DISCUSSIONS have been taking place in London and Prague between representatives of the Czechoslovak Government and the United Kingdom Government about quotas for the calendar year 1958. These discussions have not yet been concluded and provisional quotas, valid for the three months ending on March 31, have been established to enable trade in the goods listed to continue to flow between the two countries.

NEW QUOTA LISTS covering United Kingdom exports to Poland and Polish exports to the United Kingdom during 1958 under the 3-year trade arrangement signed on December 31, 1956, provide greater scope for UK exports during 1958 of goods such as machinery, machine tools, instruments, consumer goods, etc. They also provide for the export of Polish goods such as canned meat, other foodstuffs, chemicals, etc., at a somewhat higher level than in 1957.

THE DAIMLER COMPANY has announced that it is closing the foundry making cylinder blocks, light-alloy and steel castings, and that as a result 150 workers will become redundant during the month. A statement said it was part of the streamlining policy to make the company more efficient as an organization. It was pointed out that the foundry operated only on a small scale and that the three other foundries in the C.S.A. group could more than cater for the group's requirements.

THE CURRENT ISSUE of *La Fonderie Belge* contains a history of the *Association Technique de Fonderie de Belgique* by its past-president, Mr. J. Leonard. The Association was formed as a local society at Liége in 1912 with 11 members. By April 1914 this had grown to 80 and to-day it is about 300 strong. It is interesting to note that in the early days, the meetings were held on the fourth Sunday morning of each month—from 11.30 a.m. to 12.30 p.m. at the Brasserie de Diekirk.

THE INDUSTRIAL WELFARE SOCIETY announce that a series of four evening study groups for foremen and forewomen, is to be held on Mondays from January 13 at Robert Hyde House, Bryanston Square, London, W.1. The four subjects to be covered are responsibilities, discipline, training, and managing people. A second event is an IWS conference at Brighton from January 24 to 27 at which foremen and managers—attending in equal numbers—will consider problems that affect them equally.

THE CORROSION GROUP of the Society of Chemical Industry are holding a conversazione during the evening of January 23. There are to be exhibits illustrating research and development mainly in the field of protective castings. A buffet supper will be served and films will be shown. A charge of 5s. will be made to cover the cost of refreshments. The exhibition will remain on view the following day. Details are available from the assistant secretary, Society of Chemical Industry, 14, Belgrave Square, London, S.W.1.

A GROUP of young Government factory inspectors is to take a course at the Birmingham Industrial Safety Centre at Acock's Green it has been announced by Mr. Arthur Lloyd, chairman of the Birmingham and District Industrial Safety Group which runs the Centre. The announcement was made at the Group's annual dinner at which Sir George Barnett, Chief Inspector of Factories, was the chief guest. Other speakers included the Lord Mayor of Birmingham, Alderman J. J. Grogan, and the chairman designate, Mr. John Elstub.

SHELL PETROLEUM COMPANY, LIMITED, has made a donation of £15,000 to Sheffield University to help in the provision of buildings and equipment in the expanding departments of science and technology. In acknow-

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ledging the donation, the University Council stated, "In gratefully acknowledging the gift, the University is glad to note that, in spite of the difficulties the industry is going through, the Shell company recognizes that this is a time, above all others, when education in general and technical education in particular, should be encouraged."

THE LONDON BRANCH of the Institute of British Foundrymen is holding its annual dinner/dance and cabaret on January 16 in the Grand Hall, Connaught Rooms, Great Queen Street, London, W.C.2, commencing at 6.30 for 7 p.m. Although it was expected that the change this session from a Friday to a Thursday would adversely affect numbers attending, in actual fact bookings are coming in more rapidly than in previous years. This means that those who wish to come but have not yet applied for tickets should do so without further delay.

MAGNESIUM ELEKTRON, LIMITED, Swinton, Manchester, have shelved a plan to build a £1,000,000 plant at Hopton, near Wirksworth, Derbyshire, to extract magnesium from dolomitic limestone because of the credit squeeze. Dolomite in rich deposits exists in the area, and the plant was to have been built at Bone Hill Quarry, between Wirksworth and Brassington. Local councils which had been co-operating in the provision of a large supply of piped water to the site have been told that no further work will be carried out at present.

THE 35,000-TON BATTLESHIP ANSON, laid up in the Gareloch since 1952, has arrived at Faslane to be broken up by Shipbreaking Industries, Limited. This is the first of the four battleships of the King George V Class to go to the scrappers' yard. The job is expected to take two years. H.M.S. King George V, also in the Gareloch, will be broken up at the Dalmuir yard of Arnott, Young & Company, Limited. H.M.S. Duke of York is also to be broken up at Dalmuir, while H.M.S. Howe has arrived at Inverkeithing on the Forth to be broken up by Thos. Ward, Limited.

THREE NEW BAYS have been brought into use at the foundry in Ampthill Road, Bedford, of J. Hobkirk & Sons, providing an extra floor space of some 8,000 sq. ft. Two of the new bays are for non-ferrous castings. A new oil-fired furnace has been installed, together with other equipment and there has been a general reorganization of the foundry to increase production. Since 1953, the firm has been operating its non-ferrous foundry at Kempston Hardwick Works, Bedford, and with the transfer to Ampthill Road the space made available at Kempston Hardwick will now be used for the storage of patterns.

THREE REDFYRE OIL-FIRED CENTRAL-HEATING BOILERS, and other heating equipment supplied by Newton Chambers, Limited, of Thorncliffe, nr. Sheffield, have been delivered in the Falkland Islands in the Antarctic by the research ship Shackleton. The boilers, together with radiators and pipework, are to be installed in three prefabricated bungalows, which were also carried on board the Shackleton. The ship left England for her Antarctic voyage on October 1, having taken on her cargo at Southampton. The heating systems were specially packed by Newton Chambers as individual units for easy assembly on location.

PLANS FOR A JUNIOR TECHNICAL COLLEGE, costing approximately £1,000,000, will shortly be put before Aberdeen Education Committee. The site will be at Spring Garden, in the north-west of the city, and the plans provide for a seven-storey block extending from the Gallowgate to the Loch Street frontages and a four-storey block running along the Gallowgate. The latter will accommodate engineering, printing, baking, confectionery, and other workshops. One-storey workshops will be provided on a one-acre corner of the site. The main entrance will be in the Gallowgate. The estimated cost of the college is £996,870 and the sketch plans, if approved, will be sent to the Scottish Education Department.

SIR FREDERICK PICKWORTH, Master Cutler and chairman of English Steel Corporation, Limited, Sheffield, has received a letter from the managing director of the Broken Hill Proprietary Company, Limited, Australia, expressing appreciation of the way in which young Australians on a training visit to the ESC were helped and cared for. Sir Frederick originally suggested an exchange of trainees and two young Australians, Mr. John Dundar and Mr. Bruce Hands, have spent a year at Sheffield, and two ESC technicians, Mr. Brian Dyson and Mr. Don Garmonsway have recently returned from their visit to Australia. Two more Australians will arrive in Sheffield this month, and two young men will go out from Sheffield later.

A NEW AUTOMATIC CAMERA MICROSCOPE, known as the Ultraphot II, the first to reach this country, was delivered recently to Standard Telecommunication Laboratories, Limited, Dowlish Ford Mills, Ilminster, Somerset. The instrument, of which there are fewer than 12 in the whole world, costs over £1,000. In addition, a duty-free import licence was granted by the Government in view of the importance of the instrument and the fact that it is not made in the UK. The apparatus, with full automatic exposure adjusting mechanism, is suitable for visual observations as well as industrial photomicrography, and it can also be used for microprojection. Exposure mechanism is push-button operated, the instrument adjusting its exposure time automatically to correct value depending on intensity of light.

TWO EVENTS, one concerned with internal factory organization and the other with chemical sales development, took place at the Warrington works of Joseph Crosfield & Sons, Limited, recently. The first was the opening of a new training centre and this was followed by driving the first pile of the new "chemical" building—a one-million pound five-storey construction. Mr. G. J. Cole, vice-chairman of Unilever Limited, officiated at the first ceremony whilst Mr. J. A. Connel, Unilever technical director, was present at the second. The new training centre will provide for all phases of employee training from first apprenticeships, through routine refresher courses, to leadership and promotion classes. The building is equipped with its own 16-mm. sound projector and many other modern training aids.

SPEAKING AT the eleventh annual Christmas party of Follsain-Wycliffe Foundries, Limited, held in the canteen at Lutterworth, Mr. H. A. Bonney, the managing director, reported that 1957 would show a record output, and congratulated everyone on their contribution to this result. It had been achieved by the close and harmonious combination of capital and labour; by the provision of new buildings, plant and equipment and the willing effort of all employees. Presentations to employees were made during the interval by Mr. H. M. Jones (chairman). Both Mr. G. J. Mill and Mr. E. Chater had served the company for 50 of the 51 years it had been established, and they were each presented with a wallet of notes. Thirty-year awards were given to Mr. H. Ward and Mr. W. A. Chandler, bringing the total number of such awards to 40.

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Mr. GEORGE GREIG has been appointed a director of Fullwood Foundry Company, Limited.

Mr. PERCY SMITH, general sales manager of Bakelite, Limited has been appointed a director to fill the casual vacancy caused by Mr. C. C. LAST'S resignation.

Mr. L. H. GADD and been appointed financial accountant to Metal Industries, Limited, Glasgow. He was formerly chief internal auditor of the Parkinson Cowan group.

Mr. R. J. W. RUDKIN has been appointed general manager, naval yard, of Vickers-Armstrongs (Shipbuilders). He will be responsible to the shipbuilding general manager, Mr. L. REDSHAW.

Mr. JAMES LEICHMAN, aged 70, was presented with a cheque at a reception in Glasgow on December 27, by one of the directors of Federated Foundries, Limited, with which company he has been employed for 57 years.

Mr. A. J. BURTON has joined the board of Austin Motor Company, Limited following his services as a local director. Mr. T. A. E. LAYBORN, has also joined the board. He is deputy chairman of C. T. Bowring & Layborn, Limited.

Fifty-five former employees of David Brown Industries, Limited, Park Works, Huddersfield, attended the company's annual luncheon for retired long-service workers. The oldest present was Mr. H. OATES, aged 83, and the longest service worker Mr F. CRAWSHAW, 50 years.

Mr. JOHN MORRIS presided last week at a gathering of members of the Bonnybridge Foundry sheet metal department of Smith & Wellstood, Limited, when Mr. GEORGE IRVINE received a cigarette lighter and inner lining for a coat on his retirement after 50 years' service with the firm.

Mr. HAROLD FRITH, manager of Brook Motors Leeds sales office since 1920, retired at the end of last year. A presentation of a silver cigarette box was made to Mr. Frith by the directors on December 31. Mr. R. SPENCE, takes over the management of the Leeds sales office from January 1, 1958.

There were 40 recipients of long-service gold wristlet watches presented by General Refractories, Limited, at Deepcar Works Sports Club dinner/dance at Stocksbridge. They included two pairs of father and son. Mr. LEONARD YEOMANS, of the Low Wood Works, had 60 years' service, and his son, at Wharncliffe Works, 28 years. Mr. BERNARD HEATHCOTE has served 38 years, and his son, 29 years.

Mr. DUNCAN BAILEY, chairman of Charles Roberts & Company, Limited, Railway Wagon Works, Horbury Junction, near Wakefield, recently made presentations to three long-service foremen to mark their retirement. Mr. GEORGE CASS, who has been with the company for 52 years, received a pen and pencil set; Mr. JAMES FAWCETT, (39 years) a barometer; and Mr. LEWIS PINDER (20 years) a clock.

Mr. LEONARD ROTHERHAM, who has been appointed a full-time member of the Central Electricity Generating Board as from April 1, according to a Ministry of Fuel and Power announcement, was previously a physicist at Brown, Firth Research Laboratories, Sheffield (1934-46), and superintendent of the Metallurgical Department at the Royal Aircraft Establishment, Ministry of Supply.

At the ninth annual apprentices prize distribution at the Rubery Owen organization Darlaston, prizes were presented by Mrs. F. L. Owen and other members of the family. The P. J. Freeman and the J. T. Page memorial prizes for the best all-round apprentices were awarded to Mr. ANTHONY CLARE and Mr. JOHN INSKIP. A girl engineering apprentice, Miss JOSEPHINE TANDY, received a second-year award.

Mr. A. V. TIDDY, assistant secretary, Samuel Osborn & Company, Limited, Clyde Steel Works, Sheffield, has been appointed to the position of local director. Since joining the company in January 1911, Mr. Tiddy has served continuously with the exception of 3½ years war service during 1914-18 and held the successive appointments as cashier and assistant secretary. He is retaining the latter position with his appointment as local director.

Dr. B. D. THOMAS, scientist and research administrator, has been nominated to the presidency of the Battelle Memorial Institute to succeed Dr. CLYDE WILLIAMS. The active head of Battelle since being named director a year ago, Dr. Thomas has been a member of the Battelle organization for many years. He joined the staff as a research engineer in 1934, was appointed assistant director in 1942, and vice-president in July 1955.

Mr. G. H. PEARSON, works superintendent of the Burton-on-Trent factories of British Thermoplastics and Rubber manufacturers Limited, was honoured with a gold badge in recognition of 40 years' service. The occasion was a special dinner at which 28 employees were presented with long-service awards for a total of 650 years' service. Mr. P. W. Howard ,managing director, and Mr. Pearson himself, made the appropriate presentations.

On his retirement in December last after 58 years' service with Meynell & Sons, Limited, brassfounders of Montrose Street, Wolverhampton, Mr. HARRY EVANS, was presented by the chairman of the firm, Mr. CHARLES MEYNELL, with a cheque from the directors and a clock from the employees. Mr. Evans a brass turner, now 74 years of age, started with the company in 1899, and had been absent only once for a short spell of illness.

Mr. P. J. C. BOVILL, managing director of Newton Chambers & Company, Limited, Sheffield, presented long-service certificates and gratuities to four veterans retiring from the Thorncliffe Iron Works on December 23. They were Mr. THOMAS PARKINSON, a foundry inspector with 57 years' service; Mr. FRED PARRY, stores labourer, 52 years'; Mr. HENRY LATHAM WISE, toolsmith, 44 years; and Mr. WILLIAM HENRY BURGIN, labourer, 50 years.

Mr. ANDREW I. AITKEN, a graduate B.SC. (metallurgy), of Glasgow University, has been appointed manager of Colvilles' Dalzell Steel Works, Motherwell. He began his association with the firm in the research department and later took charge of the works at Mavisbank, Glasgow. During the past 10 years he has risen from the post of department chief (technical quality control) at Dalzell, through production manager, to his present office.

International Nickel Company, Inc., announce the appointments of Mr. ALBERT P. GAGNEBIN and Mr. L. E. GRUBB as assistant vice-presidents. Mr. Gagnebin continues as manager of the nickel sales department, and Mr. Grubb, who has been general superintendent of the Huntington, West Virginia, Works of International Nickel since May, 1953, will be in charge of labour relations at all United States plants. He will transfer to the company's New York office.

Dr. H. W. MELVILLE, F.R.S., secretary of the department of Scientific and Industrial Research, has been appointed to succeed Sir BEN LOCKSPEISER, K.C.B., F.R.S.,

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as one of their delegates to the Council of the European Organization for Nuclear Research (CERN). Sir Ben, who, until the end of 1957, was also president of the Council of CERN, retired from the United Kingdom public service in March, 1956, and has now asked to be relieved of his responsibilities as a Council member.

Mr. G. H. BUCHANAN, who for the past 14 years has been the representative in Scotland for Craven Brothers (Manchester) Limited, Stockport, retired on December 31. He will be succeeded by Mr. H. PROBERT who will also be in charge of the new office of the company in Scotland at 157, West George Street, Glasgow, C.2. Mr. Probert commenced with the company in 1938, serving a full apprenticeship in the works followed by many years as a draughtsman and senior designer. He has been engaged more recently upon technical sales and service.

Mr. D. POWELL of the Metal Box Company, Limited, was elected president of the Worcester Management Association at the fifth annual meeting held recently. Mr. W. J. SOWELS of the Morgan Crucible Company, Limited, was elected chairman and Mr. J. FOSTER VEEVERS of Heenan & Froude, vice-chairman. The retiring chairman Mr. J. W. MACBRATNEY reported on a successful season. A pair of pipes was presented to Mr. D. B. CAUGHEY, honorary treasurer, by Mr. Powell in recognition of his work in that position since the association was formed.

At the St. John's Works, Bradford, of Hepworth & Grandage, Limited, engineers, Mr. G. C. HEPWORTH, chairman and joint managing director, presented gold watches to 10 employees who had completed 25 years' service with the company. The recipients were Mr. W. MOORE (patternshop), Mr. T. PARKER (apprentice school), Mr. J. HASLAM (main foundry), Mr. J. M. WALSHE (liner shop), Mr. W. WAINWRIGHT (liner shop), Mr. H. INGHAM (pot ring), Mr. D. HANNAY (piston shop), Mr. A. TOULMIN (filing department), Mr. F. WATKINS (stock order) and Mr. H. BRADY (main foundry).

Mr. E. D. BOOL was elected president of Sheffield Society of Engineers and Metallurgists in succession to Mr. L. K. EVERITT, at the Society's annual meeting last month. Mr. Bool was chief engineer with the Firth Brown organization for 18 years until his retirement; he held a Ministry of Supply appointment during the war. Vice-presidents elected were:— Professor R. J. SARGANT, Dr. H. H. BURTON, Mr. F. H. SANITER, Mr. H. BULL and Mr. J. A. MCWILLIAM. To the Council were elected:— Professor J. P. DUNCAN, Dr. W. R. MADDOCKS, and Mr. J. WOOLMAN, Mr. J. H. WOODHEAD was re-elected secretary, and Mr. F. WARDROBE, treasurer.

Mr. W. W. BRAIDWOOD of the development and research department, the Mond Nickel Company, Limited, is to leave on January 11 on a business trip to Africa. During the meetings arranged in Johannesburg to mark the 21st anniversary of the founding of the South African branch of the Institute of British Foundrymen, Mr. Braidwood will present a paper on "Metallurgical Progress in the Iron Foundry in the Last Twenty-one Years." He will also be visiting foundries and other works of particular interest throughout the Union and in Southern and Northern Rhodesia, and will be lecturing in several of the main cities. On the return journey, Mr. Braidwood will visit foundries in the Belgian Congo and in Israel. He is due to arrive back in this country early in March and will be lecturing on March 13 to the Lincolnshire branch of the Institute.

Obituary

DEATH OF MR. A. McLEOD

The sudden death is announced of Mr. Alastair McLeod of the editorial staff of the *Iron and Coal Trades Review* (sister journal of FOUNDRY TRADE JOURNAL). Taken ill at his desk on January 2, he died the next day at Charing Cross Hospital, after an operation. "Mac," as he was universally known, was a rolling-mill man, before in 1934 he was appointed Editor of *Sheet Metal Industries*. This was not quite his first introduction to journalism, as prior to that appointment he wrote daily newspaper articles on his hobby which was then motor-car racing and trials. After his appointment he took a deep and practical interest in metal finishes and served on the council of the Institute of Vitreous Enamellers and was instrumental in establishing a library for the Institute's use. Later, he joined the staff of the *Iron and Coal Trades Review* and made numerous visits to the Continent to describe plant and processes of interest to readers. He was a founder of Sheet and Strip Metal Users Technical Association, SASMUTA, arranging for that body a series of continental works visits and conferences.

For many years he did not enjoy good health, being a victim of arthritis, but he never allowed this to prevent full participation in the various activities germane to an Editor's life. He was a member of a large number of technical institutes including the holding of a fellowship of the Institution of Metallurgists and membership of the Institution of Production Engineers. In these and business circles associated with the iron and steel industry his cheerful Scottish disposition will long be missed.

The death is reported from America of Mr. HERBERT S. SIMPSON. He was 73 years of age and was a past-president of the American Foundrymen's Association. His name is well known as the originator of a sand-preparing mill, known in this country as the August-Simpson Mill.

The death is reported at the age of 57 of Mr. WILLIAM FRANKLIN, a director of Davy and United Engineering Company, Limited. Mr. Franklin was a member of the Iron and Steel Institute, the Institute of Metals, and the rolling mill plant committee of the British Iron and Steel Research Association.

Mr. W. T. STEWART, died suddenly on December 22 at the age of 53. For the past 5 years he was works manager for Hattersley Bros., Limited, Swinton, Yorkshire and previously was foundry manager with Matthew Swain Limited, Newton Heath, Manchester. Mr. Stewart was an associate member of the Institute of British Foundrymen.

Mr. STANLEY WOOLASS, the late deputy chairman and commercial director of C. & J. Hampton, Limited, toolmakers, Sheffield, whose funeral took place on Monday, December 16, had been a member of the Board of Directors for 16 years. He was 65 years old, had joined Hamptons in 1906 at the age of 14, and had retired two months ago.

Mr. H. MATTHEWS, joint managing director of Crofts (Engineers), Limited, Thornbury, Bradford, died on December 28. He was 51. Mr. Matthews was also a director of Crofts Engineering (Holdings) Limited. He began working with the firm at the age of 15 as time office boy. He later transferred to the drawing office and progressed through the various technical departments until in 1943 he was appointed a sectional director of the company.

Are these the happiest men in industry?

Ex-Picture Post reporter Trevor Philpott went to Corby and talked to five men whose life is steel.

EACH OF THESE MEN has worked a lifetime by the sweat of his brow. Each plays a vital part in what is now Europe's biggest and most modern tube works. Looking back over the years, they look back in pride.

Sid Wright looked down the quarry, wide and deep as the bed of a great river, towards the six hundred and fifty ton excavator which was peeling back the earth above the iron ore. "She does as much work in fifty seconds as I used to do in a full day's work. Course, it was wheelbarrows and planks then. Now it's railway trucks and steel track. Yes, it's a satisfying sort of job, the way we do it to-day. I've had a ton or two of ore out of Northamptonshire in forty years."

'Young Sketch,' whom a few know as George Patrick, tends the four great blast furnaces. He's built rather like a blast furnace himself. Resting his hands on his bay window, he said "Yes, there's a lot of beer gone into that. I need it. But it's not as hot now as in the war, when we had the furnaces covered so you couldn't see a wink from a few hundred feet up. Now you can see the glow forty miles away on the right night.

"I was here before Stewarts and Lloyds came, and I watched them build up this plant and take it down and build it up again. And blow me if my only daughter didn't marry a blast furnaceman. He's a supervisor already."

"BOTH SIDES MUST BE PRETTY SATISFIED"

Bertie Oliver has been caring for the insides of Bessemer converters for forty-six years. "There's not much I don't know about those old ladies. I left a two-horse tram in 1911 to go on the steel plant at Bilston. I came up to Corby when they opened the new works in 1934. After the Black Country, the woods around here were a real treat. My boy's at the works, too, now and laughs his head off when I take pigs' trotters to eat on the shift."

Bill Muir came out from under the bonnet of his saloon car. "They used to say you could tell a steel man by the colour of his face," he said. "Well, look at me. Pale and interesting. They load slab furnaces by watching television screens and pressing buttons, nowadays. Between us, my brothers and I have put in a hundred and thirty-one years' service with this firm. I suppose both sides must be pretty satisfied."

600 GOLD WATCHES

'Big Chiv' (full title Charlie Clitheroe) is over seventy and looks as strong as an ox. "Six bob a week errand boy, I started as. Then someone spotted I was a pretty big lad, and I got a job on the locos. It's been locos ever since. These we've got now are little beauties. Fire her right, keep her pressure up, and she'll do anything. Gives you a good appetite, too, this job. Seventeen bob's worth of meat I'll eat, at the week-end. My wife used to say to me, 'You never praise my food, do you Charlie?' 'I never leave none, do I?' I'd say to her. The boys ask me sometimes why I don't marry again. Well, a good wife's like a good job. One's enough for most men."

All these men possess a gold watch awarded to mark thirty years of service with the firm. There are over six hundred more like them at Corby, working still. Men who began in the Steel Industry, stayed with it, and helped it to grow. This is how they talk, as they near the end of a working life well spent.

This report was commissioned by the British Iron and Steel Federation, which believes that everyone should know the facts about Steel, and about the men and organisations that make it.

Raw Material Markets

Iron and Steel

The opening of the new year brought with it a varying degree of activity in the foundry trade. In some sections, particularly the light and textile foundries, and, but to a lesser extent, some of the jobbing foundries, the position remains as it was for practically the whole of last year, when the foundries were unable to secure sufficient business to keep their plants fully employed. The anti-inflationary measures at present imposed continue to restrict business for domestic equipment, etc., on which many of the light foundries depend for their orders, and the early future holds out little prospect of an improvement in these demands.

In the early part of 1957 improved trading conditions in the motor vehicle industry resulted in a much bigger demand for castings from the foundries catering for that trade. That continued throughout the remainder of the year, and these foundries commenced the new year with good order-books and equally bright prospects. The engineering foundries supplying to other trades, including steelworks, collieries, heavy engineering, power and electrical, and machine tools, have continued to obtain fairly good outputs, although orders for machine tools during 1957 fell below the bookings for the previous year on both home and export account.

The past year showed much fluctuation in the demand for the various grades of pig-iron. The new and larger furnaces have continued to produce record outputs, which have consisted mainly of basic pig-iron for the steelworks, and they have also received appreciable tonnages of imported iron. These supplies are now meeting fully the requirements of the steel trade, and home furnaces could provide additional quantities if required, so that imports appear no longer necessary; in fact, with the decline in demand from the steelworks it has been found necessary to restrict production at some home furnaces, which have been taken out of blast or turned on to other grades of iron. In the foundry irons there continues to be a big demand for low-phosphorus grades, and producers are able to dispose promptly of their makes. Larger tonnages of hematite have also recently been taken up, and makers are able to meet these requirements without difficulty. An increased demand for refined irons could also be easily fulfilled. Demands for high-phosphorus irons continued on a diminishing scale throughout last year.

A steady demand continues for heavy cast-iron and machinery scrap and the foundries generally have good supplies. Deliveries of foundry coke are maintained at consumption levels. but most of the popular brands are none too plentiful. Ganister, limestone, and firebricks are readily available.

The re-rollers are hoping that this year will bring an improvement in the demand for their products, particularly for small bars and light sections, the call for which continues to be subdued. For other products, including reinforcing rods and sheets, there is a good demand. Billet deliveries are in keeping with requirements, and many establishments have still fairly good stocks. Home steelworks are able to meet all requirements for the normal analyses and sizes without difficulty and, apart from carbons and special quality steels, deliveries could be increased if demands permitted. The need for imported supplies has been almost entirely removed.

Many of the steelworks have stocks of defectives and crops, for which there is little call. The re-rolling trade is of opinion that the price differential of defectives compared with prime material is not sufficiently attractive.

Non-ferrous Metals

Non-ferrous metal markets on both sides of the Atlantic continue dull with all the bearish influences prevalent in 1957 remaining the dominating factors.

In copper the inability of the price to move ahead reflects the lack of confidence in producers to cut back production sufficiently to provide a stable market coupled with the absence of any clear idea as to where the US and UK economies are headed in the first six months of this year. The particular question at issue is whether Chile will join with other countries and introduce a cutback in production of at least 10 per cent. A rumour last week that this was imminent steadied the market, but without confirmation forthcoming the London price is still drifting downwards. The general question begging all others is whether the slow down in industrial activity, particularly in the US, will continue, or whether the US Government will take steps through increased armaments and easier credit conditions to moderate the economic decline now apparent. Meanwhile, the US custom smelters continue to quote 25½ cents and the producers 27 cents a pound without the business to support legitimately either quotation.

Tin remains in the shadow of the international tin restriction scheme, which should begin to show its effects around Easter. With almost a buyers' strike taking place in the United States, however, and more redundancy reported at the South Wales tinplate mills the markets on both sides of the Atlantic are lifeless. Sentiment in this market is not helped by growing stocks nor by the unsettled labour position at Penang and the dislocation of concentrates from Indonesia. In this latter connection it is now known that the Indonesian Government is no longer willing to allow the concentrates to be treated in Holland. No official statement has been made as to where they will be treated. In the United States the price is holding around 92 cents a pound.

Lead in London continues its downward drift and the absence of any news concerning the proposed import tariffs has aggravated the weakness in this market. In the US the price is 13 cents a pound. However, the bleak outlook in the US calls for the comment that it will be surprising if this price does not soon sink lower.

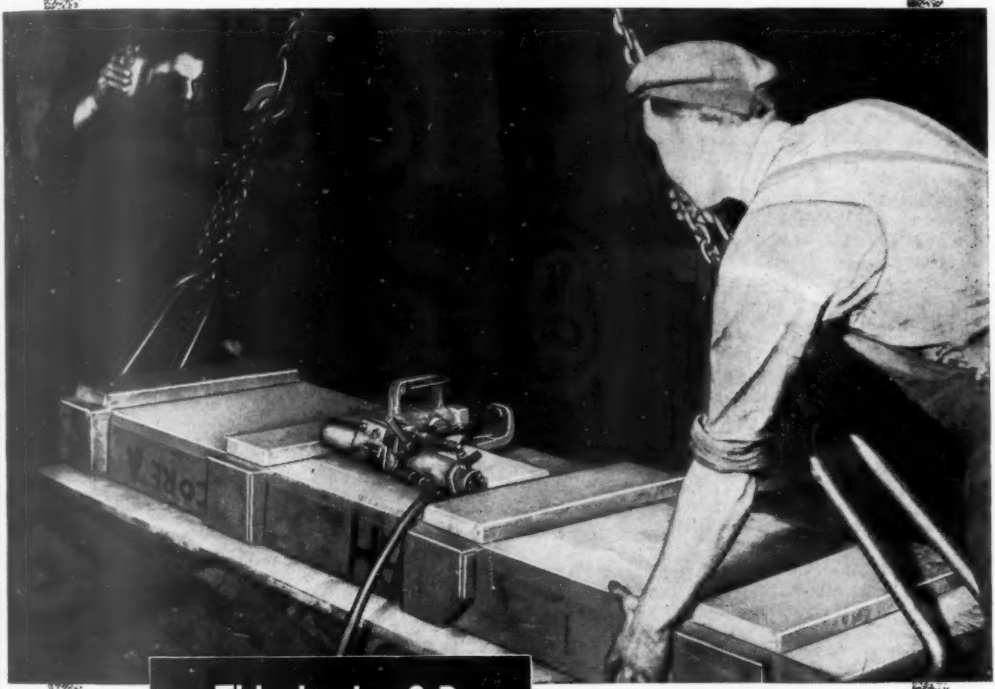
Zinc in London is now quoted around £61 a ton, equivalent to 7½ cents a pound, and compares with 10 cents a pound in the US and must be considered as an uneconomic price level. Over-production in the US and elsewhere, the poor economic outlook, and the uncertainty caused by the proposed import tariffs are the chief causes for the recession in this metal.

A LARGE CONTRACT for portable air compressors has been received by the Climax Rock Drill & Engineering Works, Limited, London, E.C.2, from the Ministry of Supply.

PLANS FOR THE MODERNIZATION of the yard of the Blythswood Shipbuilding Company, Limited, Glasgow, are being considered by the directors of the company. The number of berths is to be reduced to allow for the building of ships up to 40,000 tons d.w.

MALAYAN CABLES, LIMITED, has been formed in the Federation of Malaya by British Insulated Callender's Cables, Limited, and the Telegraph Construction & Maintenance Company, Limited. It has an initial authorized capital of 5,000,000 Malayan dollars (£583,333).

CONSOLIDATED PNEUMATIC MAKE OVER 480 DIFFERENT MODELS OF POWER TOOLS



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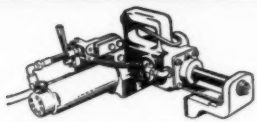

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CP116

Current Prices of Iron, Steel, and Non-ferrous Metals

(*Delivered unless otherwise stated*)

January 8, 1958

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £21 6s. 0d.; Birmingham, £20 18s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £23 17s. 0d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £24 1s. 3d.

Scotch Iron.—No. 3 foundry, £25 3s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 19s. 0d.; South Zone, £26 1s. 6d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £27 6s. 6d.; South Zone, £27 9s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. of England (local iron), £25 6s. 6d.; Scotland (Scotch iron), Zone S. 1, £25 13s. 0d.; Sheffield, £26 15s. 0d.; Birmingham, £27 4s. 0d.; Wales (Welsh iron), £25 6s. 6d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leics.

FERRO-ALLOYS

(*Per ton unless otherwise stated, delivered*)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £48 10s. 0d. to £50 15s. 0d., scale 17s. 0d. to 17s. 6d. per unit; 75 per cent. Si, £68 10s. 0d. to £76 7s. 6d., scale 17s. 0d. to 17s. 6d. per unit.

Ferro-vanadium.—50/60 per cent., 27s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 6d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £299 0s. 0d.

Ferro-tungsten.—80/85 per cent., 8s. 6d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 11s. 6d. per lb. of W.

Ferro-chrome (6-ton lots and over).—4/6 per cent. C, £93 0s. 0d. to £96 10s. 0d., basis 60 per cent. Cr, scale 32s. 0d. per unit; over 6 per cent. C, £91 0s. 0d., basis 60 per cent. Cr, scale 31s. 0d. to 32s. 0d. per unit; 2 per cent. C,* 2s. 2d. per lb. Cr.; 1 per cent. C,* 2s. 2½d. per lb. Cr; 0.15 per cent. C,* 2s. 3½d. per lb. Cr; 0.10 per cent. C,* 2s. 3¾d. per lb. Cr; 0.06 per cent. C,* 2s. 4d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 7s. 3d. to 7s. 10½d. per lb.

Metallic Manganese.—90/92 per cent., carbon-free, £290 0s. 0d.; 96/98 per cent., £310 0s. 0d.

Ferro-columbium.—65/75 per cent., Nb + Ta, 20s. 9d. to 21s. 3d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £87 19s. 3d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £33 1s. 6d.; tested, 0.08 to 0.33 per cent. C, £34 1s. 6d.; hard (0.41 to 0.60 per cent. C), £35 3s. 0d.; silico-manganese, £44 2s. 6d.; free-cutting, £37 5s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £41 7s. 0d.; silico-manganese, £44 10s. 0d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.33 per cent. C, £38 16s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £39 18s. 6d.; acid, up to 0.25 per cent. C, £43 10s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £42 12s. 0d.; boiler plates (N.-E. Coast), £45 2s. 0d.; floor plates (N.-E. Coast), £44 1s. 0d.; angles, N.-E. Coast, £40 6s. 6d.; joists, N.-E. Coast, £40 2s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in. and flats, 5 in. wide and under, untested soft basic, 50 tons and over, £40 8s. 0d. (under 10 tons to 4 tons, £41 5s. 6d.; under 4 tons to 2 tons, £41 10s. 6d.); hoop and strip coils, £40 10s. 0d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £45 16s. 0d.; black sheets (hand mill), 24 g., £59 4s. 6d.; galvanized corrugated sheets, 24 g., £67 13s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £69 9s. 6d.; nickel-chrome, £100 12s. 6d.; nickel-chrome-molybdenum, £112 16s. 6d.

NON-FERROUS METALS

Copper.—Cash, £175 15s. 0d. to £176 0s. 0d.; three months, £178 15s. 0d. to £179 0s. 0d.; settlement, £176 0s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 1s. 8¾d. per lb.; rods, 204s. 3d. per cwt. basis; 20 s.w.g., 237s. 6d. per cwt.

Tin.—Cash, £730 0s. 0d. to £730 10s. 0d.; three months, £731 0s. 0d. to £732 0s. 0d.; settlement, £730 10s. 0d.

Lead (Refined Pig).—First half January, £72 0s. 0d. to £72 5s. 0d.; first half April, £72 5s. 0d. to £72 10s. 0d.

Zinc.—First half January, £62 12s. 6d. to £63 0s. 0d.; first half April, £62 7s. 6d. to £62 10s. 0d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £95 15s. 0d.; rolled zinc (boiler plates), all English destinations, £93 10s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £82 10s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 5¾d. per lb.; sheets to 10 w.g., 155s. 6d. per cwt. wire, 2s. 3d.; rolled metal, 155s. 6d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £135; B6 (85/15), — BS249, —.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £181; HTB2 (38 tons), — ; HTB3 (48 tons), — .

Gunmetal.—BS1400, LG2 (85/5/5/5), £166; LG3 (86/7/5/2), £178; G1 (88/10/2/½), £233; (88/10/2/1), £222.

Phosphor Bronze.—BS1400, PB1 (AID released), — per ton.

Phosphor Bronze Strip, etc.—Strip, 231s. 0d. per cwt.; sheets to 10 w.g., — per cwt.; wire, 3s. 6½d. per lb.; rods, 2s. 9¾d.; tubes, 2s. 9¾d.; chill cast bars: solid, 2s. 10½d., cored 2s. 11½d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 5½d. per lb.; round wire, 10g. in coils (10 per cent.), 3s. 10d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 3s. 9d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 5½d. per lb. Antimony, English, 99 per cent., £190 0s. 0d. Quicksilver, ex-warehouse, £69 0s. 0d. Nickel, £600 0s. 0d. Aluminium ingots, £197 0s. 0d.; aluminium bronze (BS1400), AB1, — ; AB2, — .

* Average 68-70 per cent.

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Pig-iron and Steel Production

Statistical Summary of October Returns

The following particulars of pig-iron and steel produced in Great Britain are from statistics issued by the British Iron and Steel Federation. Table I summarizes activities during recent months. Table II gives production of steel ingots and castings in October and Table III, weekly average production of finished steel. Table IV gives the production of pig-iron and ferro-alloys in October, and furnaces in blast. (All figures are weekly averages in thousands of tons.)

TABLE I.—*Iron and Steel Price Index and General Summary of Pig-iron and Steel Production.*

Period.	B.o.T. Price Index, 1938 = 100.			Iron-ore output.	Imptd. ore used.	Coke to blast-furnaces.	Pig-iron, ferro-alloys prod.	Scrap used in steel prod.	Steel (incl. alloy).			
	I. & S.	Coal.	Basic materials excl. fuel[1]						Imports.[2]	Prod. ingots, castings.	Delivrs. finished steel.	Stocks.[3]
1955	276	399	529	311	244	246	240	213	29	381	305	1,247
1956	295	454	542	312	272	264	253	216	27	397	318	1,444
1957—June ..	317	498	540	322	302	274	275	222	14	419	317	1,483
July[4]	320	501	537	316	292	264	263	190	17	362	273	1,579
Aug. ..	341	502	535	299	313	267	272	190	13	373	270	1,673
Sept. ..	342	501	525	326	313	271	283	233	13	438	339	1,635
Oct.[4]	343	501	516	330	322	274	285	232	10	438	—	1,567

TABLE II.—*Weekly Average Production of Steel Ingots and Castings in October*, 1957

District.	Open-hearth.		Bessemer.	Electric.	All other.	Total.		Total ingots and castings.
	Acid.	Basic.				Ingots.	Castings.	
Derby, Leics., Notts., Northants and Essex ..	—	4.7	13.2 (basic)	2.8	0.2	19.3	1.6	20.9
Lancs. (excl. N.W. Coast), Denbigh, Flints. and Cheshire	2.3	38.8	—	2.6	0.5	42.6	1.6	44.2
Yorkshire (excl. N.E. Coast and Sheffield) ..								
Lincolnshire	—	45.7	—	—	0.1	45.6	0.2	45.8
North-East Coast	0.6	83.2	—	1.6	0.5	83.8	2.1	85.9
Scotland	2.1	49.5	—	2.7	0.3	52.1	2.5	54.6
Staffs., Shrops., Worcs. and Warwick ..	—	20.4	—	1.4	0.7	20.4	2.1	22.5
S. Wales and Monmouthshire	4.6	87.1	7.2 (basic)	1.1	0.2	99.5	0.7	100.2
Sheffield (incl. small quantity in Sheffield)	10.3	33.0	—	12.5	0.4	54.0	2.2	56.2
North-West Coast	0.1	1.8	4.9 (acid)	0.6	0.1	7.4	0.1	7.5
Total	20.0	364.2	25.3	25.3	3.0	424.7	13.1	437.8[4]
September, 1957	21.0	364.1	25.2	25.0	2.9	425.5	12.7	438.2
October, 1956[4]	19.9	343.8	27.2	25.1	3.1	406.5	12.6	419.1

TABLE III.—*Production of New Non-alloy and Alloy Finished Steel.*

Product.	1955.	1956.	1956.	1957.	
			Sept.	August.	Sept.
Non-alloy steel:					
Ingots, blooms, billets and slabs[5]	4.9	4.7	5.3	3.7	5.1
Heavy rails ..	9.4	9.7	11.1	7.5	11.5
Sleepers, etc. ..	2.0	1.8	1.2	1.1	2.2
Plates, 3 mm. and over	46.1	50.2	55.3	49.7	55.6
Other heavy prods.	47.8	50.3	55.0	45.9	54.7
Ferro-con. bars, etc.	7.0	7.8	8.2	7.9	10.2
Wire rods	22.2	22.9	23.1	22.1	25.5
Arches, etc. ..	9.6	10.1	11.1	10.4	11.5
Other light sections	36.8	41.4	43.8	29.1	39.0
Bright steel bars ..	7.8	8.0	7.9	5.3	7.4
Hot-rolled strip ..	24.1	24.5	26.4	15.7	24.5
Cold-rolled strip ..	8.1	7.5	7.6	5.2	7.8
Sheets, incl. coated:					
(i) Hot rolled ..	16.6	15.0	16.4	10.8	13.7
(ii) Cold reduced	26.1	24.8	26.3	28.0	29.6
Tin and terneplate	15.6	15.9	17.3	11.7	21.8
Blackplate ..	1.4	1.3	1.3	0.6	1.2
Steel tubes, pipes..	22.9	26.2	27.2	20.8	28.7
Tube, pipe fittings	0.4	0.5	0.5	0.4	0.5
Tyres, wheels, axles	4.8	4.6	4.4	3.6	5.1
Forgings (excl. drop forgings) ..	2.5	3.0	3.4	2.6	3.2
Steel castings ..	4.2	4.5	5.0	4.0	5.0
Tool and magnet steel	0.3	0.3	0.3	0.2	0.3
Total	320.6	335.0	358.1	286.3	364.1
Alloy steel	15.8	17.3	19.2	13.7	20.3
Total deliveries from U.K. prod.[6] ..	336.4	352.3	377.3	300.0	384.4
Add: Imported finished steel ..	18.9	19.5	14.2	11.1	9.3
	355.3	371.8	391.5	311.1	393.7
Deduct: Intra-industry conversion[7] ..	50.9	55.2	60.5	41.8	55.8
Total new material ..	304.4	316.6	331.0	269.3	337.9

TABLE IV.—*Production of Pig-iron and Ferro-alloys during October*, 1957

District.	Furnaces in blast.	Hemat-ite.	Basic.	Foundry.	Forge.	Ferro-alloys.	Total.
Derby., Leics., Notts., Northants and Essex	22	2.4	23.9	19.3	0.6	—	46.2
Lancs. (excl. (N.W. Coast), Denbigh, Flints. and Cheshire ..	6	—	21.7	—	—	1.2	22.9
Yorkshire (excl. N.E. Coast and Sheffield) ..	—	—	—	—	—	—	—
Lincolnshire ..	10	—	42.3	—	—	—	42.3
North-East Coast	20	4.8	55.5	—	—	1.0	61.3
Scotland	10	0.8	23.1	1.3	—	—	25.2
Staffs., Shrops., Worcs., and Warwickshire..	6	—	9.1	1.7	—	—	10.8
S. Wales and Monmouthshire	11	4.9	47.2	—	—	—	52.1
Sheffield	2	—	3.1	—	—	—	3.1
North-West Coast	9	19.6†	—	0.1	—	1.9	21.6
Total ..	96	32.5	225.9	22.4	0.6	4.1	285.5[8]
September, 1957..	97	28.7	226.6	23.9	0.4	3.1	282.7
October, 1956[4] ..	98	32.7	198.0	26.1	0.5	3.4	260.7

[1] Used in non-food-manufacturing industry.
[2] Weekly average of calendar month.
[3] Stocks, mainly ingots and semi-finished, at the end of the years and months shown.
[4] Five weeks, all tables.
[5] Other than for conversion into any other form of finished steel listed.
[6] Includes finished steel produced in the U.K. from imported ingots and semi-finished steel.
[7] Material for conversion into other products also listed in this table.

Forthcoming Events

JANUARY 13

Institute of British Foundrymen

Sheffield and district branch: Discussion—"Foundry Research Projects," 7 p.m., at the Sheffield College of Commerce & Technology, Department of Engineering, Pond Street.

Incorporated Plant Engineers

Dundee branch: "Planned Maintenance," by A. J. MacIntyre, 7.30 p.m., at Mathers Hotel.

JANUARY 14

Institute of British Foundrymen

Coventry and district section: "Recent Developments and Current Trends of British Shell-moulding Practice," by D. F. Bailey, 7.30 p.m., at the Coventry Technical College, Room A.5.

Institution of Works Managers

Wolverhampton branch: "Factory Acts," by E. W. Huddy, 7.30 p.m., at the Molineaux Hotel, North Street.

JANUARY 15

Institute of British Foundrymen

Southampton section: "The Story of Steel"—three technical films, 7.30 p.m., at the Technical College, St. Mary's Street. (Joint meeting with the Southampton Metallurgical Society.)

Society of Chemical Industry

Corrosion group: "Stress Corrosion Cracking," by T. P. Hoar and J. G. Hines, 6.30 p.m., at 14, Belgrave Square, London, S.W.1.

Incorporated Plant Engineers

Kent branch: "Some Notes on Boiler Inspection and Insurance," 7 p.m., at the King's Head Hotel, High Street, Rochester.

Institute of Metals

"Mechanism of Clustering and Precipitation in Metals," by Dr. David Turnbull, 6.30 p.m., at 17, Belgrave Square, London, S.W.1.

JANUARY 16

Institute of British Foundrymen

Northampton and district section: "The Hot-blast Cupola as an Economic Unit for Producing Castings to BS :1452 Grade 12," by J. Henderson, 7.30 p.m. at the Georgian Room, Hind Hotel, Wellingborough.

Institution of Works Managers

Doncaster branch: "Cost control," by W. I. Glass, 7.30 p.m., at the Earl of Doncaster Hotel.

Incorporated Plant Engineers

Blackburn branch: "Fuel and Power Policy," by Gerald Nabarro, M.P., 7.30 p.m., in the Lecture Hall.

JANUARY 17

Manchester Association of Engineers

"Corrosion in Action," by R. Butcher, 6.45 p.m., at the Engineers' Club, Albert Square.

Increases in Capital

PERMALI, LIMITED, Gloucester, increased by £104,000, in 2s. ordinary shares, beyond the registered capital of £520,000.

STOTHERT & PITT, LIMITED, Bath, increased by £750,000, in £1 ordinary shares, beyond the registered capital of £1,250,000.

BRISTOL DIECASTING COMPANY, LIMITED, Bristol, increased by £20,000, in £1 shares, beyond the registered capital of £10,000.

RIPPINGILLES, LIMITED, Birmingham, increased by £240,000, in 5s. ordinary shares, beyond the registered capital of £110,000.

BROWN BAYLEY, LIMITED, Sheffield, increased by £2,350,000, in £1 ordinary shares, beyond the registered capital of £50,000.

LEWIS SPRING COMPANY, LIMITED, Redditch, increased by £44,000, in £1 ordinary shares, beyond the registered capital of £21,000.

VICKERS, LIMITED, London, S.W.1, increased by £15,000,000, in £1 ordinary shares, beyond the registered capital of £45,000,000.

HOLSET ENGINEERING COMPANY, LIMITED, Huddersfield, increased by £99,000, in £1 ordinary shares, beyond the registered capital of £1,000.

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MOULDER desires change. Experienced in all types of moulding. Apprentice trained; willing to take over responsible position if required. Age 48. House needed.—Box MD297, FOUNDRY TRADE JOURNAL.

QUALIFIED FOUNDRY EXECUTIVE seeks position as Assistant Foundry Manager and/or Methods Engineer, with a progressive company, where initiative is welcomed. Experienced Mass Production, Jobbing Patternmaking, etc., in Cast Iron, Aluminium and Steel. Box QF552, FOUNDRY TRADE JOURNAL.

FOUNDRY WORKS MANAGER (46), resident Lancs, seeks appointment with progressive Foundry Company. Time-served practical man with wide experience and sound technical training. Accustomed to full responsibility all aspects of foundry production and administration. Salary expectation £1,500 minimum. Box FW291, FOUNDRY TRADE JOURNAL.

FOUNDRY MANAGER seeks similar or as Technical or Sales Representative position in Scotland. Experience in jobbing, machine tools and general engineering castings, sand, cupolas. Metallurgically trained, sales experience. Box FM292, FOUNDRY TRADE JOURNAL.

FOUNDRY MANAGER (48), M.I.B.F., A.M.I.P.E., life experience foundry trade, covering jobbing, repetition, speciality, grey, high duty, malleable (whiteheart), non-ferrous, light alloys, fully practical (apprenticeship served), excellent technician, practical metallurgist, metal melting, cupola control, etc., castings from ozs. to 5 tons, excellent knowledge commercial, sales, all estimation, quotation, etc., desires position early new year. Small foundry, preferably country, or Wales (at present Midlands), offering really full scope and suitable rewards for real results. Control and congenial position essential. Old established firm only considered.—Box MF296, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

FOREMAN required for Ironfoundry in East Anglia, producing light castings. Machine and hand moulding involved. Must be good organiser, as production comprises small quantities off many patterns. State education, training and practical experience.—Box FR293, FOUNDRY TRADE JOURNAL.

FOUNDRY FOREMAN required by Midlands Iron Foundry producing heavy colliery pulleys and medium engineering castings from green, dry and loam sand moulds. Must be fully conversant with modern moulding and cupola practice. Non-contributory Pension Scheme applicable after period of satisfactory service.—Please state age and previous experience to THOMPSON & SOUTHWICK, LTD., The Foundry, Tamworth.

SITUATIONS VACANT—*contd.*

OLD established firm of Ironfounders in the Manchester area, anxious to secure the continuity of their Business, seek additional DIRECTOR, with experience in the Iron Foundry Business. Excellent prospects open to a person willing to accept full share of responsibility. Box OE286, FOUNDRY TRADE JOURNAL.

ASSISTANT MANAGER, aged 25/40, required for an investment casting foundry in the West of England. Practical experience, particularly in melting and casting, will be regarded as essential. The ability to handle labour with tact and firmness will be an asset. Good prospects and working conditions. Applications in confidence to Box AM287, FOUNDRY TRADE JOURNAL.

FOREMAN PATTERNMAKER

Required by

MACHINE TOOL MANUFACTURERS

For shop producing wood and metal patterns for 1-5 ton castings. Good salary for fully skilled man, 35-50 years, with previous experience as foreman or chargehand, able to control and get the best out of skilled workmen and apprentices.

Send full details of age, education, experience and present salary to:—

Personnel Manager

W. E. SYKES, LIMITED

Manor Works Staines

HARRIS SCARFE, LTD., ADELAIDE, SOUTH AUSTRALIA.

VACANCY IN FOUNDRY SUPPLIES DEPARTMENT.

THIS large and well-established Merchant Company in Adelaide has a vacancy for a man with a first-class knowledge of Founder's Metals, Moulder's Requisites, etc. Age 25-35.

The appointment carries nominations under the Assisted Passage scheme for the successful applicant and his family, and rented accommodation will be available. There is a contributory pension scheme.

Only men well experienced in this line should apply, and they should write, with details of age, married state, training and experience, and with copies of testimonials, if available, to:

DAVIS & SOPER, LTD.,
52 and 54, St. Mary Axe,
London, E.C.3.

31st December, 1957.

SITUATIONS VACANT—*contd.*

FOREMAN MOULDER wanted to take charge of well equipped jobbing foundry, machine tool castings up to three tons, good prospects for energetic man. FREDK. HOPE (CIRENCESTER), LTD., Watermoor Foundry, Cirencester.

PATTERNSHOP FOREMAN required, experienced in quality wood and metal pattern equipment essential. Manchester area. Apply stating (in strict confidence) experience, positions held, age, and salary range. Box PF551, FOUNDRY TRADE JOURNAL.

A VACANCY will shortly arise for an ASSISTANT MANAGER in the Steel Department of TURTON BROTHERS & MATTHEWS LTD., Sheffield. The appointment will involve control of the foundry, where magnet and other special steel castings are produced. Preference will be given to applicants with practical experience of modern foundry techniques. Apply in writing, stating age and experience to THE SECRETARY, P.O. Box 40, Sheffield.

WORKS ENGINEER required by Birmingham Foundry. Experience in maintaining plant, buildings, and controlling a Maintenance Dept., essential.—Reply, giving details of experience and salary required, Box WE554, FOUNDRY TRADE JOURNAL.

IRONFOUNDRY FOREMAN wanted for Manchester area, with experience in Coremaking and General Moulding Loose Pattern Jobbing work. Must have ability to control men.—Write, with full particulars of experience, stating salary required, Box IF533, FOUNDRY TRADE JOURNAL.

REPRESENTATIVES & AGENTS

JOHN G. STEIN & COMPANY LIMITED, BONNYBRIDGE, SCOTLAND

MANUFACTURERS of Refractories require a TECHNICAL REPRESENTATIVE for the Lancashire Area. Residence in the Manchester Area necessary. Personality first consideration, but technical background of a heat-using industry desirable, i.e. ferrous, non-ferrous, glass, ceramic or cement trades. Write giving full particulars in the first instance to SALES DIRECTOR at the above address.

TECHNICAL REPRESENTATIVE. Scotland and Newcastle area, required to sell Investment Castings (Lost Wax Process). Applicants (age between 25-30 approximately), who should preferably have knowledge of general engineering, foundry and metallurgical principles, would be given an initial training period.—Apply to P.I. CASTINGS (ALTRINCHAM), LTD., Atlantic Street, Altrincham, Cheshire.

REPRESENTATIVE.—A Sales Representative is required for a large foundry company in the Glasgow area. The works include jobbing and mechanised foundries producing heavy and light engineering castings in cast-iron and non-ferrous alloys. Applicants should have sound experience in foundry representation, and should preferably reside in the Midlands area. Salary and commission. Applications will be treated in confidence.—Box RA299, FOUNDRY TRADE JOURNAL.